VHF FM TRANSCEIVER

TK-250

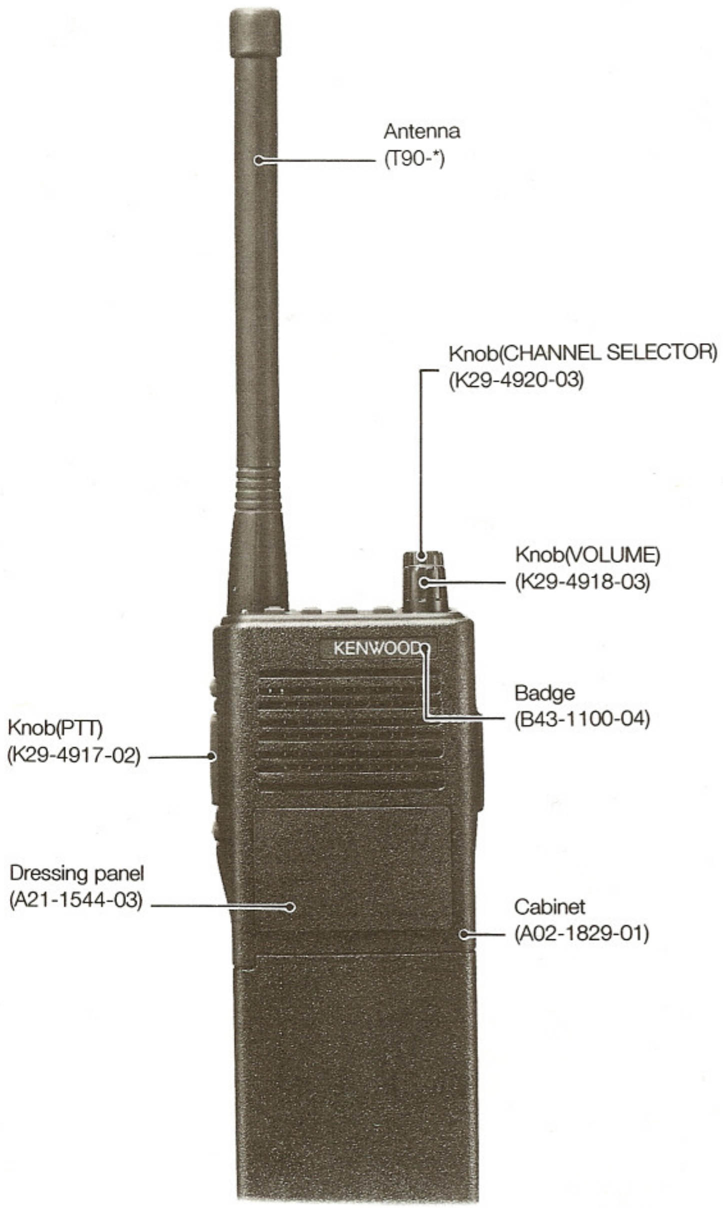
SERVICE MANUAL

REVISED

KENWOOD

B51-8279-20 (B) 1558

This service manual is the same as the service manual (B51-8279-10) for TK-250 (K , K2, M and M2 destinations) except that this manual contains new items (T, E destinations).
Use it together with the previous service manual (B51-8279-10).



*Refer to parts list on page 33.

CONTENTS

CAUTION :

When using an external power connector, please use with maximum final module protection of 9V.

GENERAL

INTRODUCTION

SCOPE OF THIS MANUAL

This manual is intended for use by experienced technicians familiar with similar types of commercial grade communications equipment. It contains all required service information for the equipment and is current as of the publication data. Changes which may occur after publication are covered by either Service Bulletins or Manual Revisions. These are issued as required.

ORDERING REPLACEMENT PARTS

When ordering replacement parts or equipment information, the full part identification number should be included. This applies to all parts : components, kits, or chassis. If the part number is not known, include the chassis or kit number of which it is a part, and a sufficient description of the required component for proper identification.

PERSONNEL SAFETY

The following precautions are recommended for personnel safety :

- DO NOT transmit until all RF connectors are verified secure and any open connectors are properly terminated.
- SHUT OFF and DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.
- This equipment should be serviced by a qualified technician only.

SERVICE

This radio is designed for easy servicing. Refer to the schematic diagrams, printed circuit board views, and alignment procedures contained within.

NOTE

WE CANNOT guarantee oscillator stability when using channel element manufactured by other than KENWOOD or its authorized agents.

Version	Frequency range	Remarks		QT/DQT	Battery	Charger
K, M, T, E (TYPE 1)	150~174MHz	IF1 LOC	45.05MHz 45.505MHz	○	OP	OP
K2, M2 (TYPE 2)	136~150MHz	IF1 LOC	45.05MHz 45.505MHz	○	OP	OP

Frequency table for using user mode at time of shipment

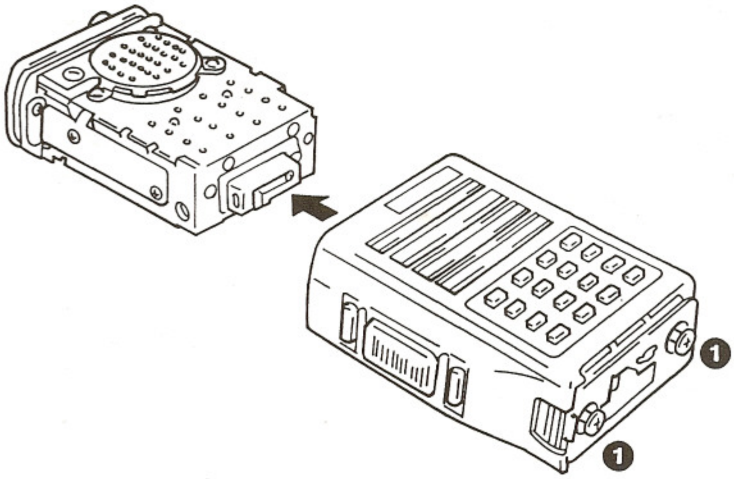
CH	Destination / Frequency	K, M, T, E (TYPE 1)	K2, M2 (TYPE 2)	QT/DQT	SCAN
1	TX	162.000MHz	143.000MHz	–	DEL
	RX	162.100MHz	143.100MHz		
2	TX	150.000MHz	136.000MHz	–	DEL
	RX	150.100MHz	136.100MHz		
3	TX	173.975MHz	149.975MHz	–	DEL
	RX	173.900MHz	149.900MHz		
4	TX / RX	162.500MHz	143.500MHz	141.3Hz	ADD
5	TX / RX	162.550MHz	143.550MHz	151.4Hz	ADD
6	TX / RX	162.600MHz	143.600MHz	162.2Hz	ADD
7	TX / RX	162.550MHz	143.550MHz	023N	ADD
8	TX / RX	162.650MHz	143.650MHz	151.4Hz	DEL

DISASSEMBLY FOR REPAIR

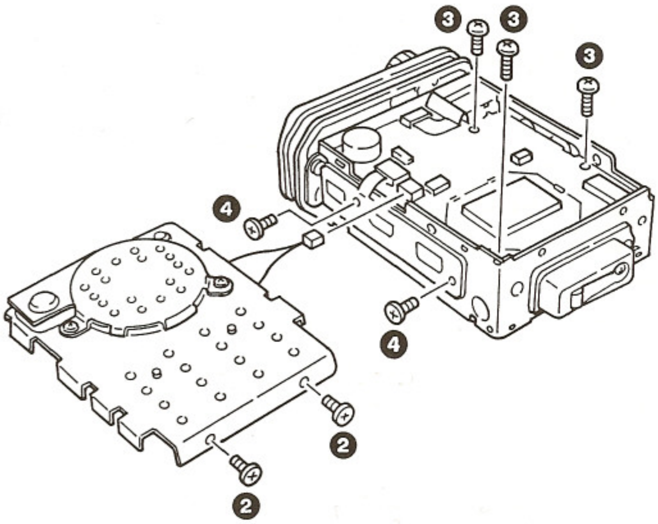
1. Loosen the two screws (❶) and remove the frame assembly from the case.

Note:

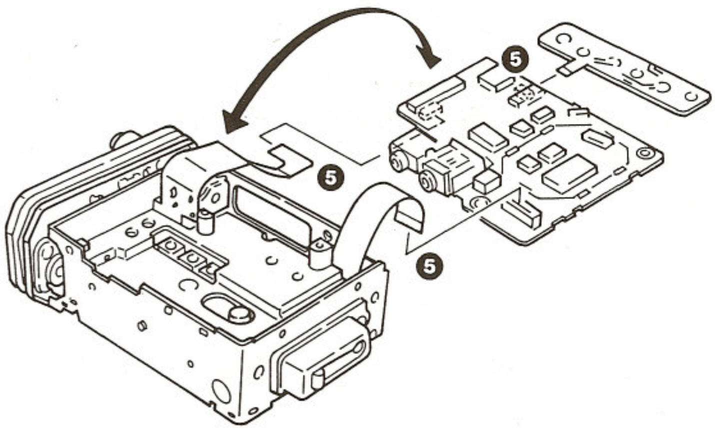
The case is stiff because of internal waterproofing. To avoid marring the set when pulling it out, use a screwdriver covered with a piece of cloth to depress the + side of the main unit battery connector and remove the case.



2. Remove the two shield plate screws (❷), the speaker connector, the three control printed circuit board screws (❸) and the two side switch FPC screws (❹).

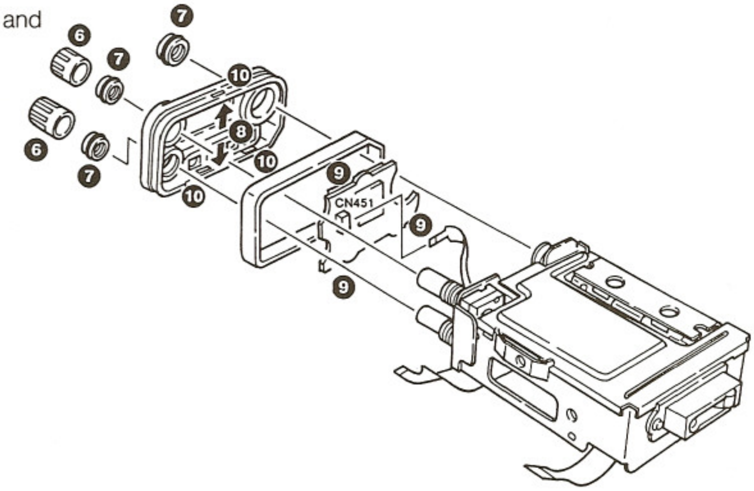


3. Flip over the control printed circuit board and remove the three connectors (❺).

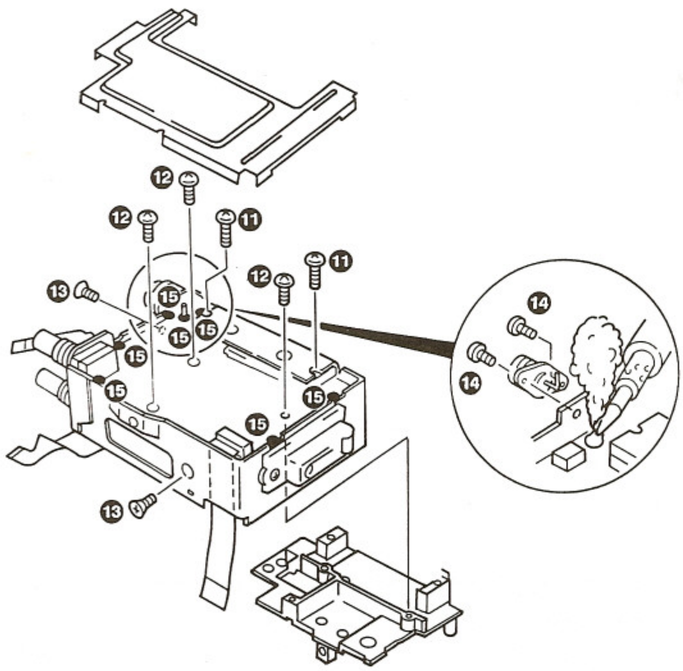


DISASSEMBLY FOR REPAIR

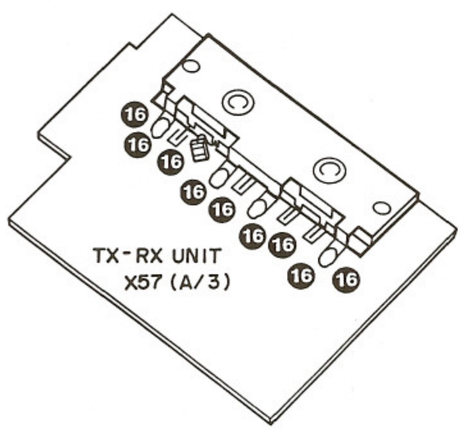
4. Remove the two knobs (6) and the three round nuts (7) with the rings still attached.
   Spread the panel (8) slightly and remove the display section tabs (9) from the panel grooves (10) and remove the display. Then remove connector CN451.



5. Remove the final shield plate, remove the two screws (11), the three TX-RX printed circuit board screws (12), and the two shield cover attachment screws (13), and remove the shield cover. Remove the two antenna co-axial connector screws (14) and remove the seven soldered connections (15).You can now remove the TX-RX unit.



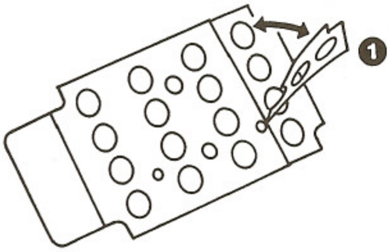
6. Remove the nine soldered connections (16) and remove the shield plate and the final module from the TX-RX printed circuit board.



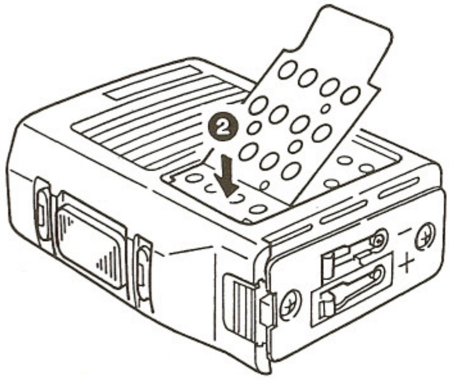
INSTALLATION

DRESSING PANEL (ACCESSORIES)

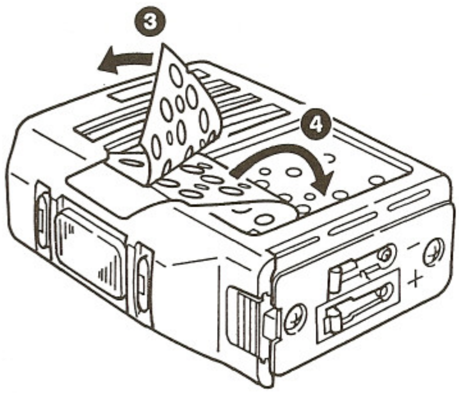
1. Peel off the right-hand side (the shorter section) of the brown backing material (❶) on the back side.



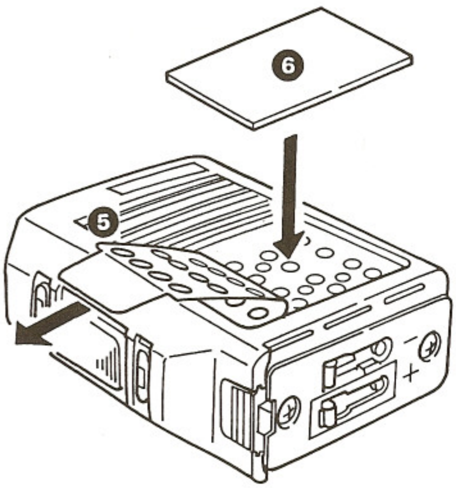
2. In the despression on the TK-250's top side, apply the adhesive sheet (see Step 1. above) from the left-hand side, and align it properly. The sheet adhesive is very strong, so please align carefully.
   Press the exposed portion of the adhesive surface firmly into place (❷).



3. Peel off the remainder of the brown backing material (❸) on the back side and press (❹) the sheet onto the main unit.



4. Remove the backing material (❺) from the front side and press the dressing panel (❻) into place.

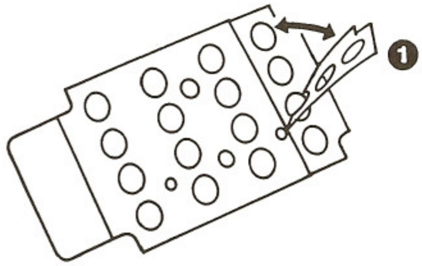


INSTALLATION

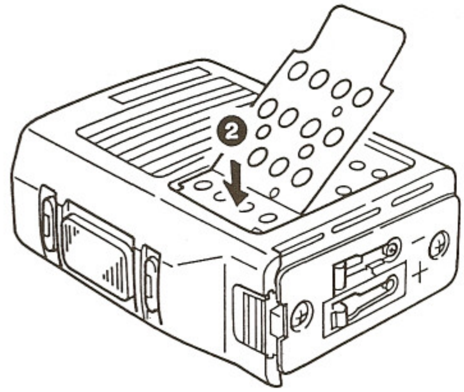
DTMF UNIT(KDM-7 Option) ATTACHMENT METHOD

Keyboard attachment

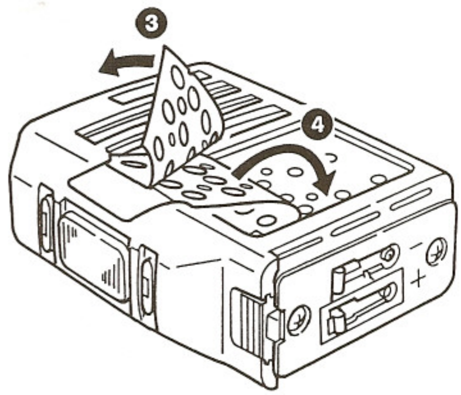
1. Peel off the right-hand side (the shorter section) of the yellow backing material (❶) on the back side.



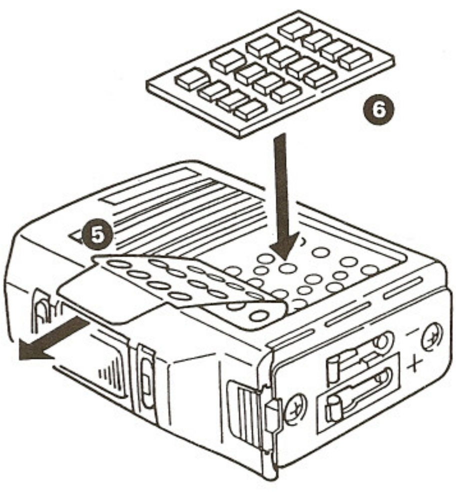
2. In the depression on the TK-250's top side, apply the adhesive sheet (see Step 1. above) from the left-hand side, and align it properly. The sheet adhesive is very strong, so please align carefully.
   Press the exposed portion of the adhesive surface firmly into place (❷).



3. Peel off the remainder of the yellow backing material(❸) on the back side and press (❹) the sheet onto the main unit.



4. Remove the backing material (❺) from the front side and press the keyboard (❻) into place.



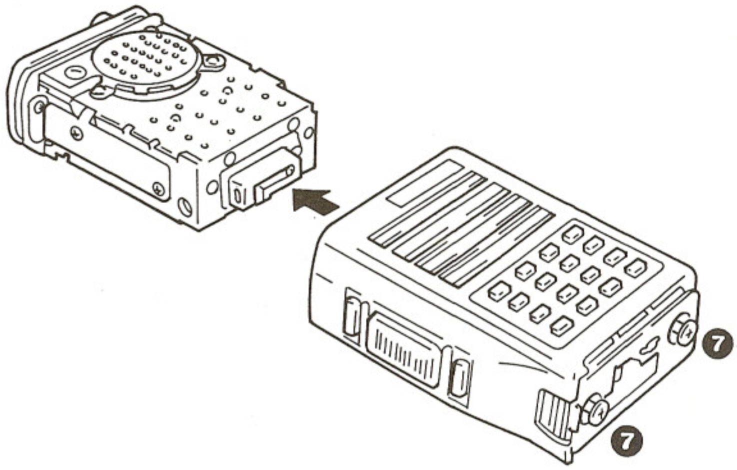
INSTALLATION

Keypad attachment method

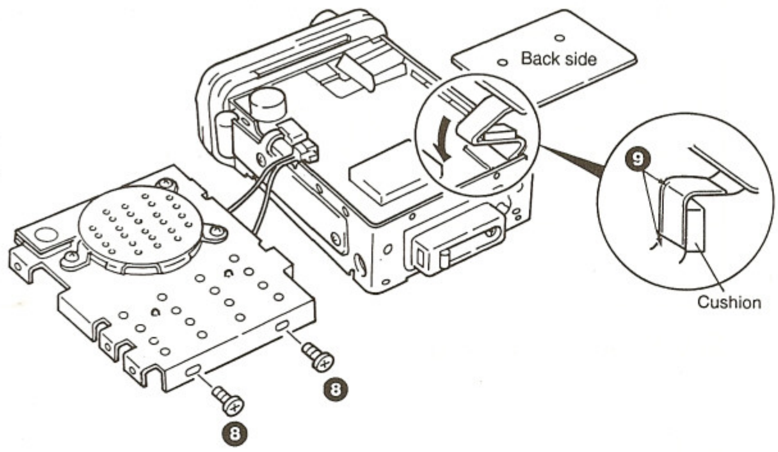
5. Loosen the two screws (❼) on the underside of the frame assembly and remove the frame assembly from the case.

Note:

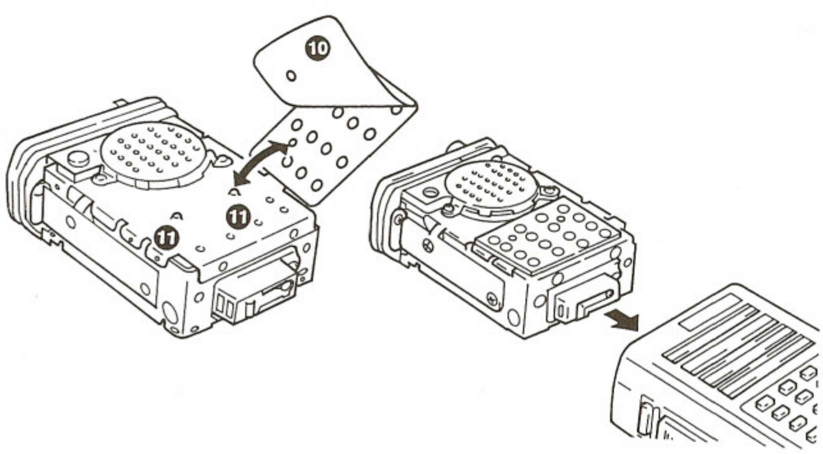
The case is stiff because of internal waterproofing. To avoid marring the set when pulling it out, use a screwdriver covered with a piece of cloth to depress the + side of the main unit battery connector and remove the case.



6. Remove the two screws (❽) and remove the shield plate.
   Insert the keypad flat cable into the connector(CN204), fold the flat cable as shown in the figure, so that the cushion is inserted (❾), and with the keypad bent back out of the way, press it into place.

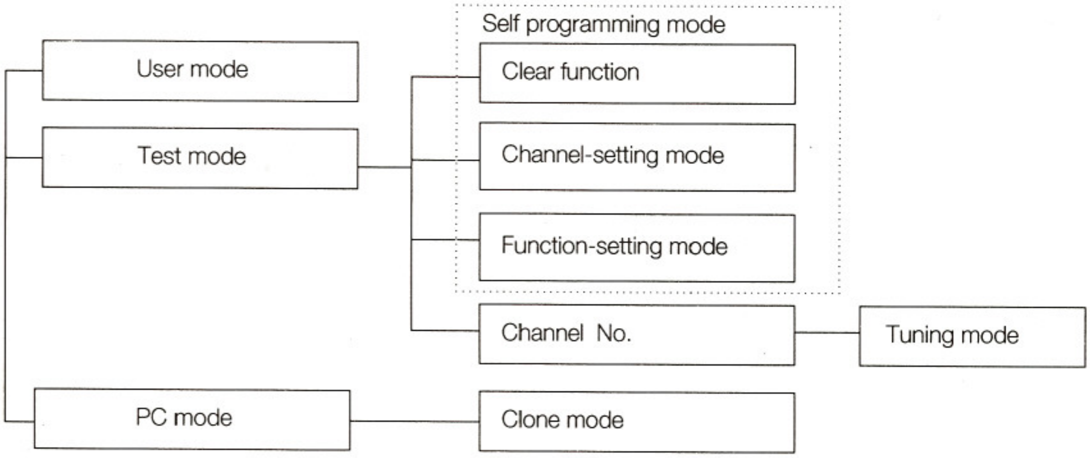


7. While pressing on the flat cable of the keypad, bend it under the shield plate, " sandwich " it there, replace the shield plate and tighten the screws.
   Peel off the keypad adhesive's backing material (❿), align the projections atop the shield plate with the holes (11) in the keypad, press it firmly into place and return the frame assembly to the case.



REALIGNMENT

1. Modes



Mode	Function
User mode	Normal use
Clear function	Initializes the function and ch contents.
Channel-setting mode	The dealer sets each channel in this mode.
Function-setting mode	The dealer sets the functions in this mode.
Tuning mode	The transceiver tuning in this mode. Realignment method refer to ADJUJSTMENT.
PC mode	Destination data, function data, and channel settings are transferred from or to an IBM PC.
Clone mode	Destination data, function data, and channel data settings are transferred from or to another transceiver.

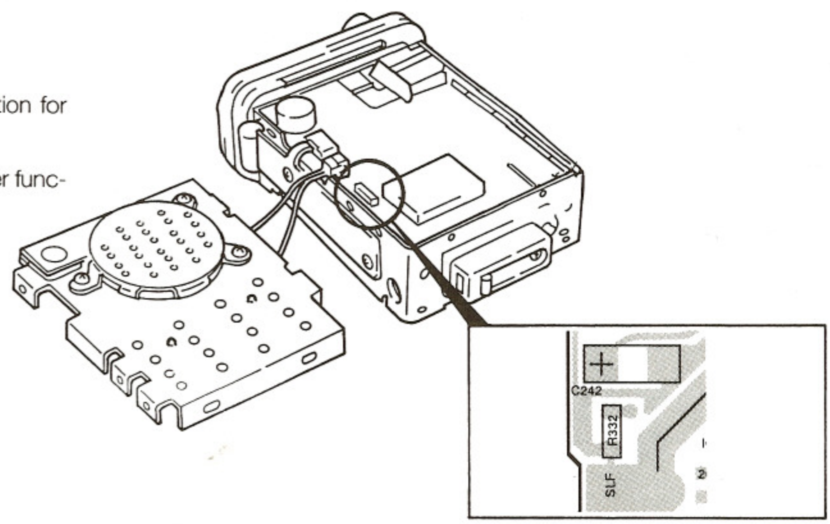
2. Self programmnig

When conducting self programming (clear function mode , channel setting mode, function setting mode,) , please remove the TX-RX unit (B/3) chip jumper(R332).

Note :

Self programming is 32ch model setting function for one without FPU.

Setting methods are follows 4-1, 4-2, 4-3. Other functions can't be used on self programming .

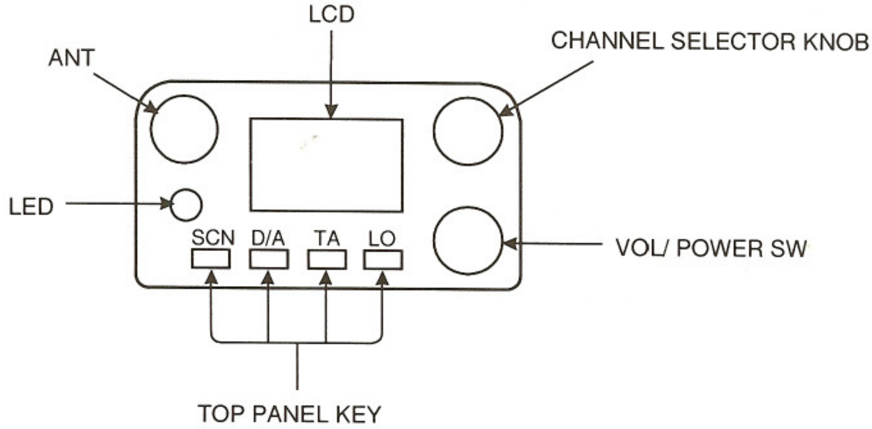


3. How to enter each mode

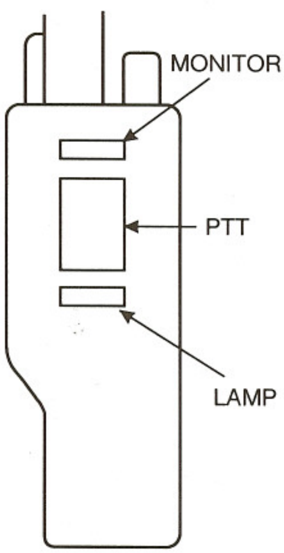
Mode	Operation
User mode	Power ON
Test mode	[LAMP] + [D/A] + Power ON (two seconds)
PC mode	[LAMP] + [LO] + Power ON (two seconds)
Clone mode	[PC Mode] + [D/A]

REALIGNMENT

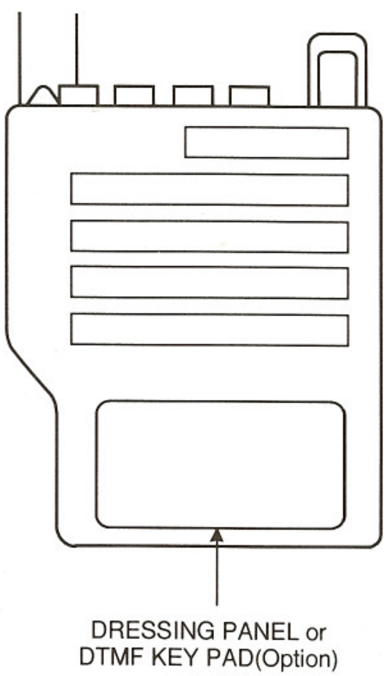
<TOP VIEW>



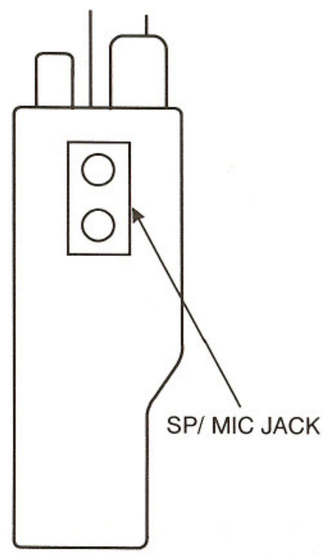
<LEFT SIDE VIEW>



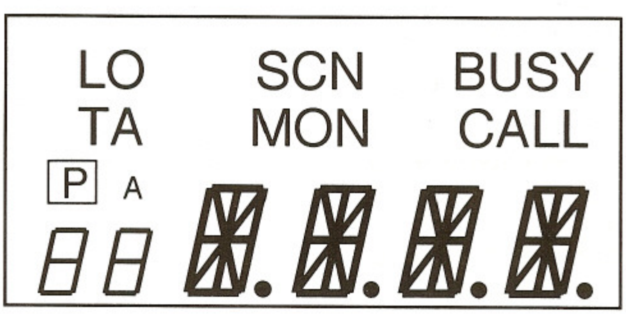
<FRONT VIEW>



<RIGHT SIDE VIEW>



<LCD>



REALIGNMENT

4. Test mode

In the test mode, the dealer initializes E²PROM data, and tuning the trsansceiver and sets functions and channel data.

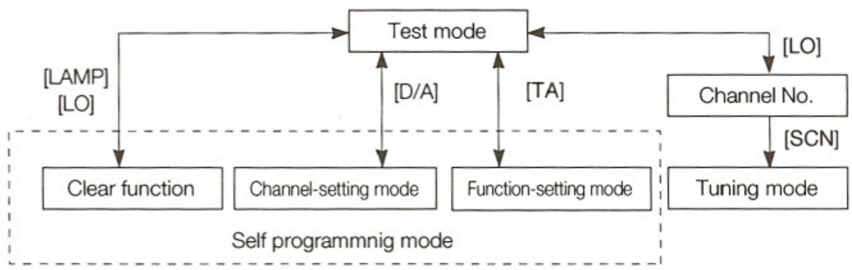
● **Procedure**

1) Press LAMP, D/A together and turn power on. Hold LAMP and D/A until " SEL " appears on LCD.

Test mode display



2) If the [LAMP] key is held down and the [LO] key presse when SEL is displayed, E²PROM data (except destinatio data) is initialized. When the [LO] key is pressed, the tunin mode is entered. When the [TA] key is pressed, the se programmnig mode(function-setting mode) is entered When the [D/A] key is pressed, the self programmin mode(channel-setting mode) is entered.



4-1 Self programming mode (Clear function)

The clear function initializes the memory before the dealer sets functions and channels. The memory is not initialized at the factory. If the [LAMP] key is held down and the [LO] key pressed in the test mode, the memory is initialized(then display indicate CLR while it is being cleared), and the test mode returns.

4-2 Self programming mode(Channel-setting mode)

In the self programming mode(channel-setting mode), the receive frequency, receive signaling, transmit frequency, and transmit signaling for each channel are set.

NOTE :

Self programming mode is function for 32ch model.
When entered Self programming mode, channel setting has been 32ch. To 160ch version , set on for using FPU.

1) Receive frequency setting mode

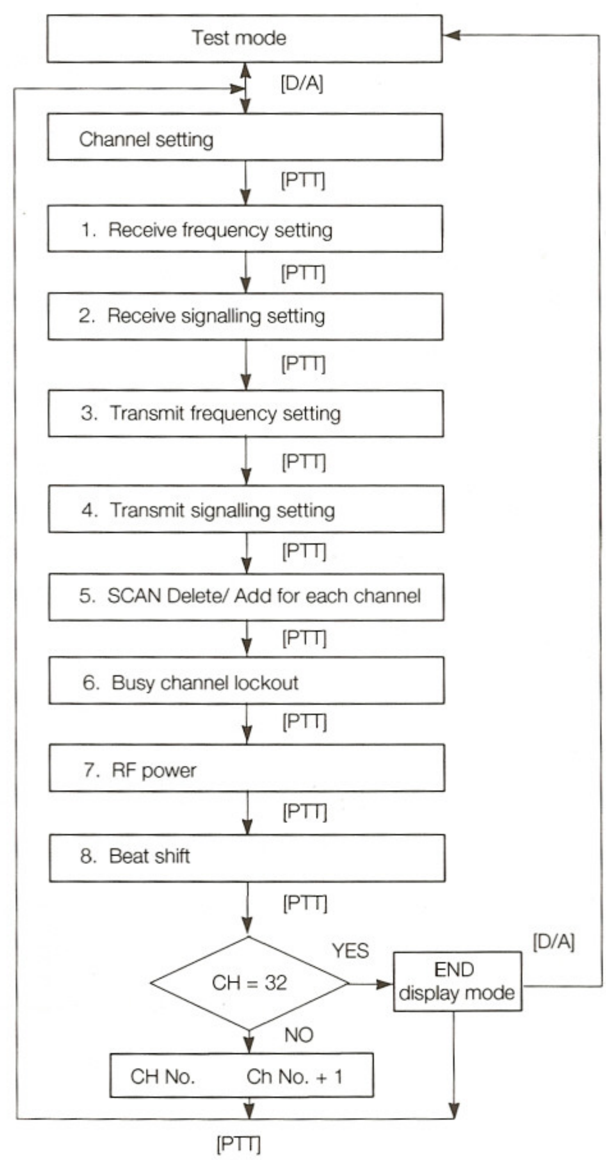
If there is no data stored in the E²PROM , " - - - - - " is displayed. If the [LO] key is pressed, the initial frequency is displayed. If there is data stored in the E²PROM, the frequency is displayed.

If the [TA] key is pressed, the step changes between 5 kHz and 6.25kHz. (Initial value : 6.25kHz)

If the channel selector is turned, the frequency changes in steps. If the [LAMP] key is held down and the channel selector turned, the 1MHz digit is incremented or decrement. If the [PTT] key is pressed, the display frequency is written into the E²PROM, and the receive signaling setting mode is entered.

2) Receive signalling setting mode

If there is no data stored in the E²PROM , " - - - " is displayed. If the [LO] key is pressed, the initial QT value of " 67.0 " is displayed. If the [LO] key is pressed again, the inital DQT value of " 023N " is displayed. If there is data stored in the E²PROM, the signalling is displayed.



REALIGNMENT

If the [TA] key is pressed :

QT : the mode changes between the EIA mode and the fine tuning mode.

DQT : the variable digit changes from the third to the second to the first and back to the third.

Selection in the standard table

023, 024 ....

Selection at every step

777↔ 000 ↔ 001 ↔ .... 007 ↔ 010 ↔ ....

If the [D/A] key is pressed :

QT : Nothing changes.

DQT : The mode changes between normal and inverse.

If the channel selector is turned :

QT : The frequency changes.

DQT : The code changes.

If the [PTT] key is pressed, the display signalling is written into the E²PROM, and the transmit frequency setting mode is entered.

3) Transmit frequency setting mode

If there is no data stored in the E²PROM , " – – – – – " is displayed. If the [LO] key is pressed, the receive frequency for that channel is displayed. If there is data stored in the E²PROM, the frequency is displayed.

If the [TA] key is pressed, the step changes between 5kHz and 6.25kHz. (initial 6.25kHz)

If the channel selector is turned, the frequency changes in steps. If the [LAMP] key is held down and the channel selector turned, the 1MHz digit is incremented or decremented. If the [PTT] key is pressed, the display frequency is written into the E²PROM, and the transmit signalling setting mode is entered.

4) Transmit signalling setting mode

If there is no data stored in the E²PROM, " – – – " is displayed. If the [LO] key is pressed, the intial QT value of "67.0" is displayed. If the [LO] key is pressed again, the initial DQT value of "023N" is displayed. If there is data stored in the E²PROM, the signalling is displayed.

If the [TA] key is pressed :

QT : The mode changes between the EIA mode and the fine tuning mode.

DQT : The variable digit changes from the third to the second to the first and back to the third.

Selection in the standard table

023, 024 ....

Selection at every step

777↔ 000 ↔ 001 ↔ .... 007 ↔ 010 ↔ ....

If the [D/A] key is pressed :

QT : Nothing changes.

DQT : The mode changes between normal and in verse.

If the channel selector is turned :

QT : The frequency changes.

DQT : The code changes.

If the [PTT] key is pressed, the display signalling is written into the E²PROM , and the receive frequency setting mode is entered.

5) SCAN DELETE/ADD activity

When the channel selector is turned, the display changes.

DEL ↔ ADD

6) Busy channel lockout

When the channel selector is turned, the display changes.

OFF ↔ ON

7) RF power activity

When the channel selector is turned, the display changes.

H ↔ M ↔ L

8) Beat shift activity

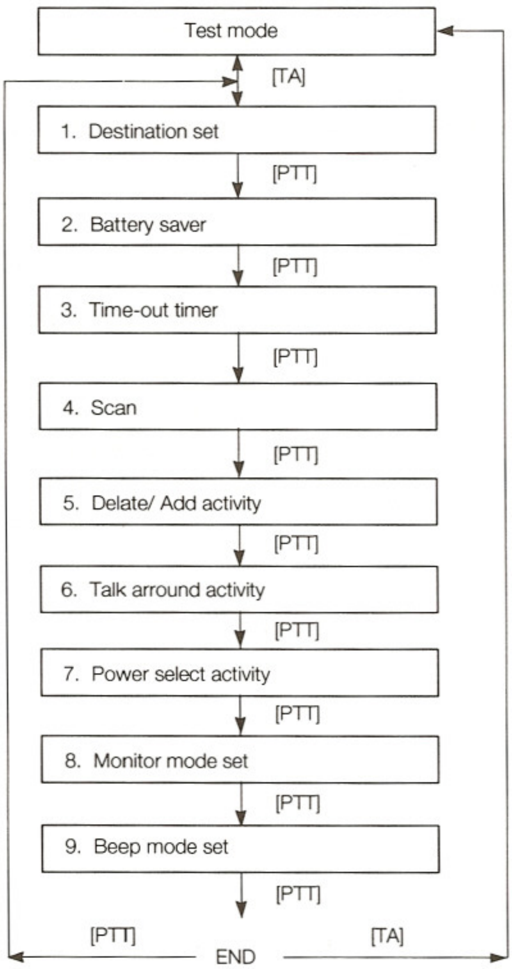
When the channel selector is turned, the display changes.

ON ↔OFF

When 32channels have been set, "END" is displayed. If the [D/A] key is pressed while "END" is beeing displayed, the test mode returns (SEL is displayed). If the [PTT] key is pressed , the receive frequency setting mode for one channel is entered.

REALIGNMENT

4-3 Self programming mode(Function-setting mode)



In the self programming mode(function-setting mode), the functions are set in the order listed below. When the [PTT] key is presed, the displayed data is written into the E²PROM, and the next item can be set.

● ( ) : Initial value

1) Destination set

When the channel selector is turned, the display changes.

UHF1 ↔ UHF2 ↔ UHF3 ↔ UHF4 ↔ VHF1 ↔ VHF2

Destination setting configuration

Code	Band	Frequency version	IF Frequency	Heterodyne
0	UHF1	450 ~470	45.05MHz	LOWER
1	UHF2	470~490	45.05MHz	LOWER
2	UHF3	490~512	45.05MHz	LOWER
3	UHF4	406~430	45.05MHz	LOWER
4	VHF1	150~174	45.05MHz	UPPER
5	VHF2	136~150	45.05MHz	UPPER

2) Battery saver

When the channel selector is turned, the display changes.

OFF ↔ S ↔ M ↔ L (OFF)

3) Time-out timer

When the channel selector is turned, the display changes.

30 ↔ 60 ↔ 90 ↔ 120 ↔ 150 ↔ 180 ↔ 210 ↔ 240 ↔ 270 ↔ 300(60)

4) Scan

When the channel selector is turned, the display changes.

OFF ↔ SCAN(SCAN)

5) DELETE/ADD

When the channel selector is turned, the channel changes.

D/A1 ↔ D/A2 ↔ OFF(D/A2)

6) Talk around activity

When the channel selector is turned, the display changes.

TA ↔ OFF(TA)

7) Power select activity

When the channel selector is turned, the display changes.

LO ↔ OFF(LO)

8) MONITOR mode set

When the channel selector is turned, the display changes.

OFF ↔ SIG1 ↔ SIG2 ↔ SQL

9) BEEP mode set

When the channel selector is turned, the display chahges.

ON ↔ OFF(ON)

When the all the items have been set, " END " is displayed. If the [PTT] key is pressed, item 1(Destination set) appears again. If the [TA] key is pressed, the test mode returnes (SEL is displayed).

5. Tuning mode

Setting method refer to ADJUSTMENT.

REALIGNMENT

6. PC mode

- **Preface**

  The TK-250 transceiver is programmed by using a personal computer, programming interface (KPG-22) and programming software (KPG-23D).

  The programming software can be used with an IBM PC or compatible. Figure 1 shows the setup of an IBM PC for programming.

- **Connenction procedure**

① Connect the TK-250 to the personal computer with the interface cable.

② Hold down the [LAMP] and [LO] keys, and turn the POWER switch on. (Hold down the [LAMP] key for at least two seconds.) When the PC mode in entered, "–PC–" is displayed on the LCD.

When data transmitting from transceiver the red LED goes on.

When data receiving to transceiver the green LED goes on.

Notes:

- Do not connect the interface cable in the normal receive mode.
- The data stored in the personal computer must match VHF, UHF, and IF when it is written into the E^2PROM.
- Do not press the [PTT] key during data transmission or reception.
- Change the TK-250 to PC mode. then plug in.

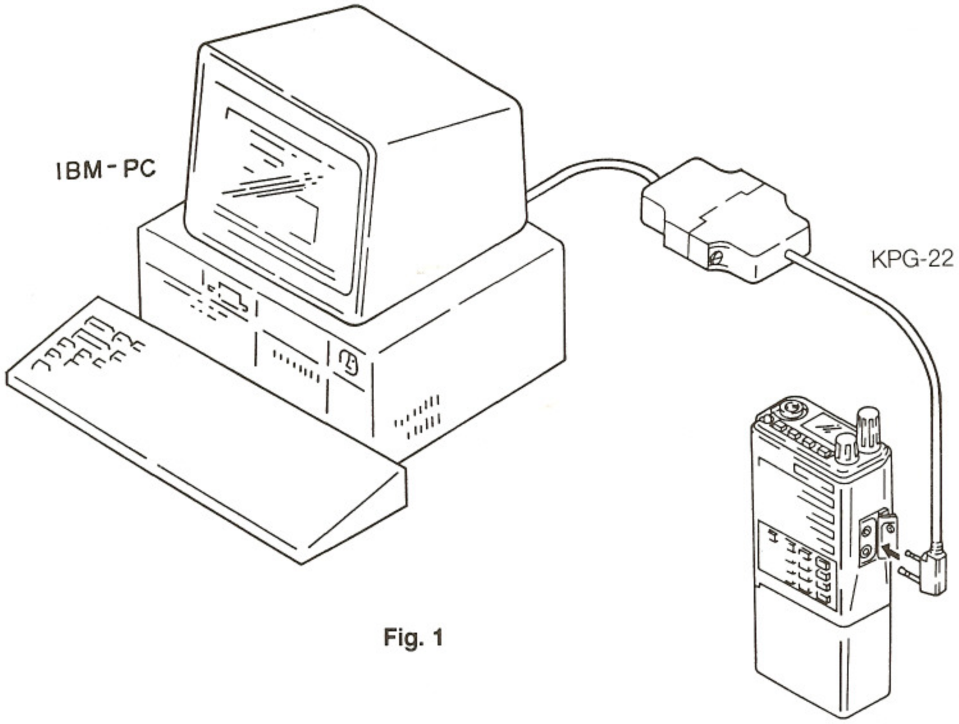


Fig. 1

- **KPG-22 description**

  (P.C. programming interface cable: Option)

  The KPG-22 is required to interface the TK-250 to the computer. It has a circuit in its D-subconnector (25-pin) case that converts the RS-232C logic level to the TTL level.

  The KPG-22 connects the side panel jacks of the TK-250 to the computers RS-232C serial port.

- **Programming software description**

  The KPG-23D Programming Disk is supplied in 5-1/4" and 3-1/2" disk format. The Software on this disk allows a user to program TK-250 radios via Programming Interface cable (KPG-22).

- **Programming with IBM PC**

  If data is transferred to the transceiver from an IBM PC with the KPG-23D, the destination data (basic radio information) for each set can be modified. Normally, it is not necessary to modify the destination data because their values are determined automatically when the frequency range (frequency type) is set.

  The values should be modified only if necessary.

  Data can be programmed into the E^2PROM in RS-232C format via the SP MIC plug.

  In this mode the PTT and CLN lines operate as TXD and RXD data lines respectively.

(KPG-23D Instruction Manual
Parts No: B62-0476-08)

REALIGNMENT

7. Clone Mode

Enter from PC mode while pressing D/A key.

In the clone mode, two transceivers are connected together and the contents of the E²PROM of one transceiver are copied to the E²PROM of the other.

The optional KCT-8 is used for cloning. For the connection method, see Figure 2.

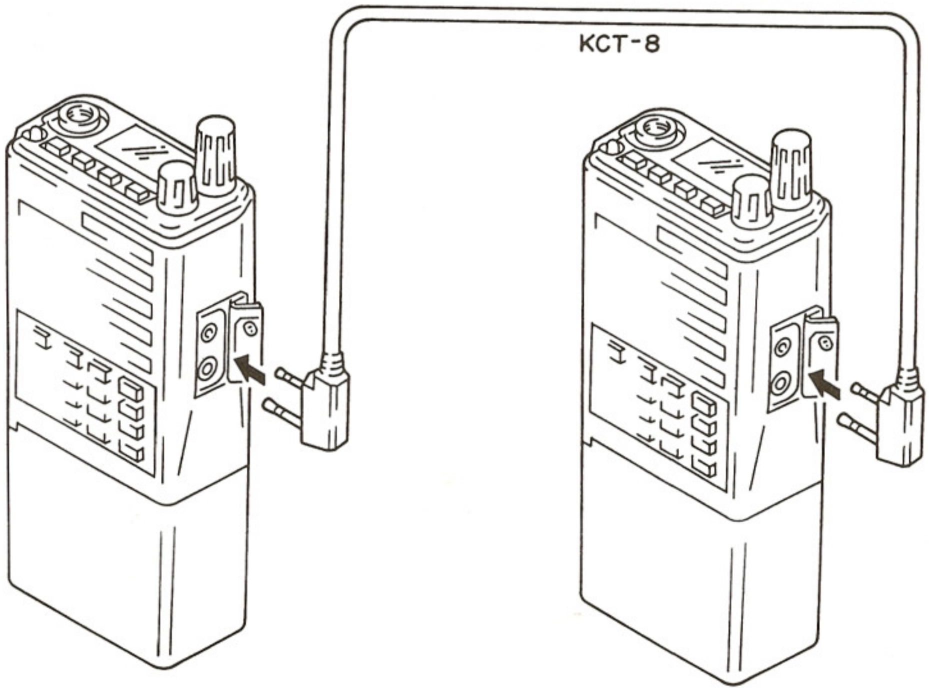


Fig. 2

- **Procedure**

① Connect the two TK-250 transceivers in the clone mode with the KCT-8 Interface cable.

② On the data reception side, while depressing the [LAMP] and [LO] keys, turn the power switch ON to enter the PC mode (the [LAMP] key remains illuminated for two seconds). Additionally, on the data trransmission side, press the [D/A] key to enter the clone mode ; " –C– " appears on the display.

③ When the [MONI] key on the transmitter is pressed, the E²PROM data is copied, and the ON AIR indicator lights. The state of the receiver does not change. After (about 40 seconds) the E²PROM copying ends, and "END" is displayed on transmission side LCD. The ON AIR indicator on the transmitter goes off.

④ If the [SCAN] key is pressed while END is being displayed , ''– C –'' is displayed again, and cloning is made possible.

Notes:

- VHF, UHF, and IF must match.
- Do not press the [PTT] key during data transmission.
- The TK-250/350 cannot be cloned with any other models.

REALIGNMENT

8. User mode

In the user mode, the user uses the transceiver.
To enter this mode, switch the power on in the use mode.

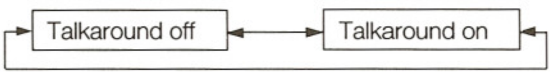
- **Initial state**

Function/state	Power on	Initial value
Transmit/receive mode	Receive	←
CH	Backup	Lowest channel memorized
MONI	OFF	←
LAMP	OFF	←
Power	Backup	Each CH setting
SCAN	OFF	←
D/A	Backup	All channels DEL
TA	Backup	OFF

- **Functions**

Encoder : Channel up/down
MONI : MONI on/off
TA : The talkaround is turned on or off each time the key is pressed.
D/A : Scan delete/add change

1) Talkaround
The talkaround function is used to transmit data with the receive frequency and receive signaling. The talkaround is turned on or off each time the [TA] key is pressed. It does not work during scanning. The talkaround is turned off if the channel is changed with the encoder or if scanning starts.
The talkaround function can be selected in the self programming mode(function setting mode).



Mode	Function
Talkaround off and PTT	Transmit with the transmit frequency and transmit signaling.
Talkaround on and PTT	Transmit with the receive frequency and receive signaling.

CIRCUIT DESCRIPTION

1. OVERVIEW

The KENWOOD model TK-250 is a VHF/FM hand-held transceiver designed to operate in the frequency range of 150 to 174 MHz. The unit consists of a receiver, a transmitter, a phase-locked loop (PLL) frequency synthesizer, power supply circuits a control unit, a display unit.

2. CIRCUIT CONFIGURATION BY FREQUENCY

The receiver is a double-conversion superhetrodyne with a first intermediate frequency (IF) of 45.05MHz and a second IF of 455kHz. Incoming signals from the antenna are mixed with the local signal from the PLL to produce the first IF of 45.05MHz.

This is then mixed with the 45.505MHz second local oscillator output to produce the 455Hz second IF. This is detected to give the demodulated signal.

The transmit signal frequency is generated by the PLL VCO, and modulated by the signal from the microphone. It is then anplified and sent to the antenna.

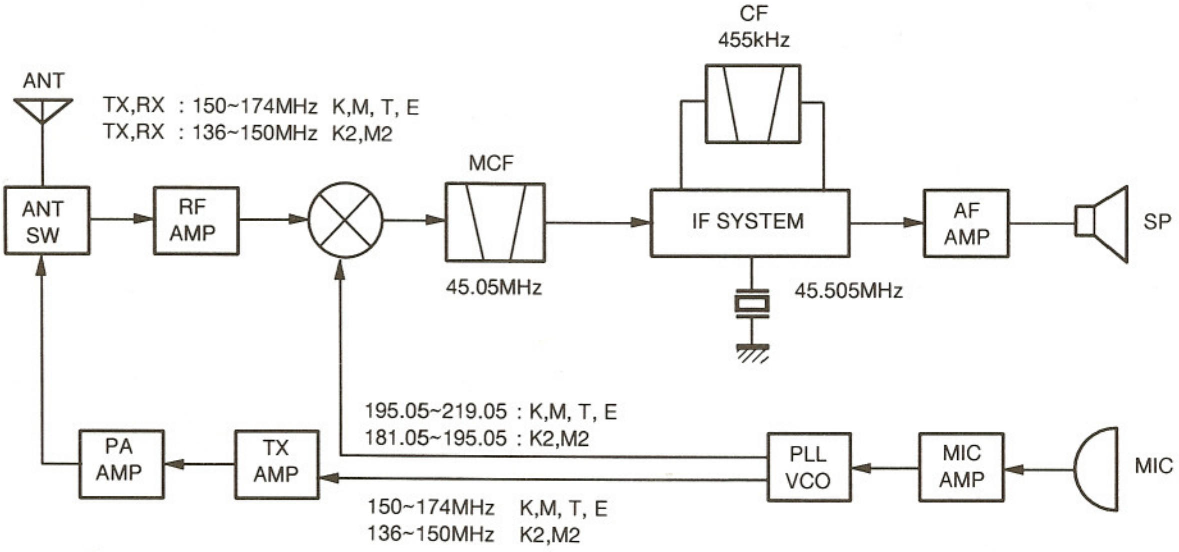


Fig. 1 Frequency configuration

3. RECEIVER SYSTEM

The receiver is double conversion superhetrodyne, designed to operate in the frequency range of 150 to 174MHz(K,M) and 136~150MHz(K2,M2).

3.1 Front-end RF amplifier

An incoming signal from the antenna is applied to an RF amplifier (Q17) after passing through a transmit/receive switch circuit (D8 and D9 are off) . After the signal is amplified, the signal is filtered by a Band-shift type band-pass filter to eliminate unwanted signals before it is routed to the first mixer.

3.2 First mixer

The signal from the RF amplifier is heterodyned with the first local oscillator signal from the PLL frequency synthesizer circuit at the first mixer (Q14) to become a 45.05MHz first intermediate frequency (1st IF) signal. The first IF signal is fed through two monolithic crystal filters (MCFs : XF1) to further remove spurious signals.

Item	Rating
Nominal center frequency	45.05MHz
Pass band width	±7.5kHz or more at 3dB
Attenuation band width	±22kHz or less at 2.5dB
Ripple	1.0dB or less
Insertion loss	4dB or less
Guaranteed attenuation	80dB or more within ±910kHz (Spurious : 40dB or more)
Terminating impedance	800Ω/2pF

XF1 : L71-0409-15(Except T)

Item	Rating
Nominal center frequency	45.05MHz
Pass band width	±3.75kHz or more at 3dB
Attenuation band width	±14.0kHz or less at 40dB
Ripple	1.0dB or less
Insertion loss	4dB or less
Guaranteed attenuation	80dB or more within ±1000kHz (Spurious : 40dB or more)
Terminating impedance	290Ω/7pF

XF1 : L71-0461-05(T)

CIRCUIT DESCRIPTION

3.3 IF amplifier

The first IF signal is amplified by Q10, and then enterd IC2 (FM IC). The signal is heterodyned again with a second local oscillator signal within IC2 to become a 455kHz second IF signal. The second IF signal is fed through a 455kHz ceramic filter to futher eliminate undesired signals before it is amplified and FM detected in IC2.

3.4 Audio amplifier

The recovered audio signal obtained from IC2 is amplified by IC208 (1/2)(control board), low-pass filtered by IC205 (2/2), high-pass filtered by IC205 (1/2) and band-eliminate filtered by IC211 (1/2). The audio signal is then passed through an audio frequency switch (Q204) and de-emphasized by IC211 (2/2). The processed audio signal passes through an audio volume control and is amplified to a sufficient level to drive a loud speaker by an audio power amplifier (IC222).

3.5 Squelch and mute

The output signal from the squelch circuit, which consists of IC208 (2/2) and Q203, is applied to the microprocessor. The microprocessor passes information to the shift registor (IC213) and it controls the mute control lines (AF MUTE and AC) according to the input signal (noise pulse) and the microprocessor task condition.

Item	Rating
Nominal center frequency	455kHz
6dB band width	±7.5kHz or more
40dB band width	±15.0kHz or more
Ripple	2.0dB or less (455kHz±5kHz)
Guaranteed attenuation	25dB or more within fo±100kHz
Insertion loss	6dB or less
Terminal impedance	1.5kΩ

CF1,2 : L72-0906-05 (Except T, E)

Item	Rating
Nominal center frequency	455kHz
6dB band width	±6.0kHz or more
40dB band width	±12.5kHz or more
Ripple	1.5dB or less (455kHz±4.0kHz)
Guaranteed attenuation	27dB or more within fo±100kHz
Insertion loss	6dB or less
Terminal impedance	1.5kΩ

CF1,2 : L72-0927-05(E)

Item	Rating
Nominal center frequency	455kHz
6dB band width	±4.5kHz or more
40dB band width	±11.0kHz or more
Ripple	2.0dB or less (455kHz±3.0kHz)
Guaranteed attenuation	25dB or more within fo±100kHz
Insertion loss	6dB or less
Terminal impedance	1.5kΩ

CF1,2 : L72-0922-05(T)

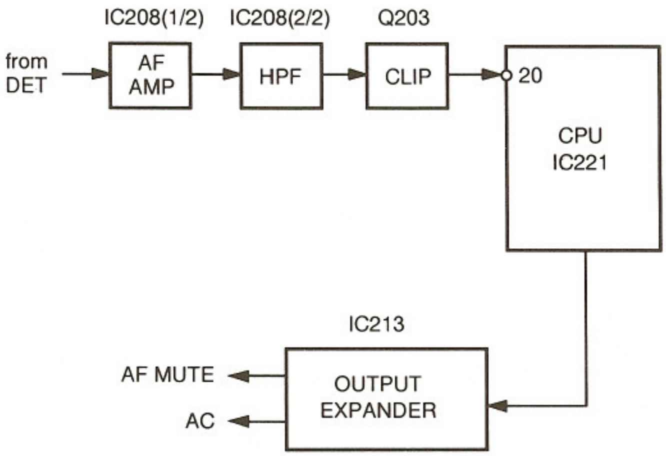


Fig. 3 Squelch and Mute

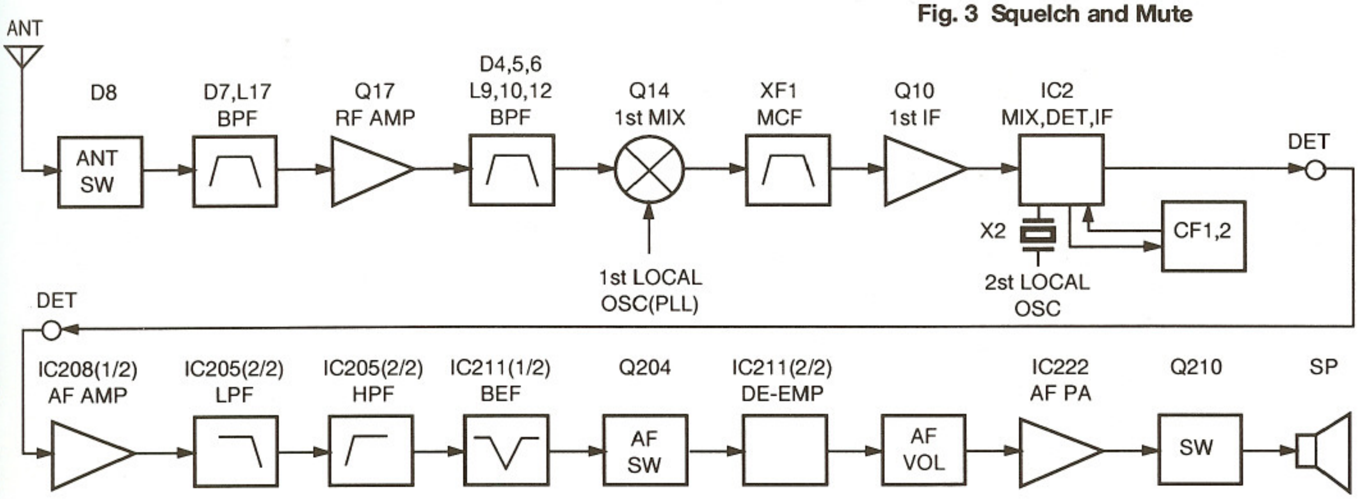


Fig. 2 Receiving system

CIRCUIT DESCRIPTION

4. TRANSMITTER SYSTEM

4.1 Microphone amplifier

The signal from the microphone is high-pass filtered by IC207 (1/2), passed through microphone mute circuit (Q202), limited and pre-emphasized by IC207 (2/2), before being passed to the low-pass filter network (IC216).

4.2 Modulator

The output of the low-pass filter network (IC216) is passed to the D/A converter (IC206) for maximum deviation adjustment and the summing amplifier (IC201 2/2) before being applied to a varactor diode (D504) in the voltage controlled oscillator (VCO) located in the frequency synthesizer section.

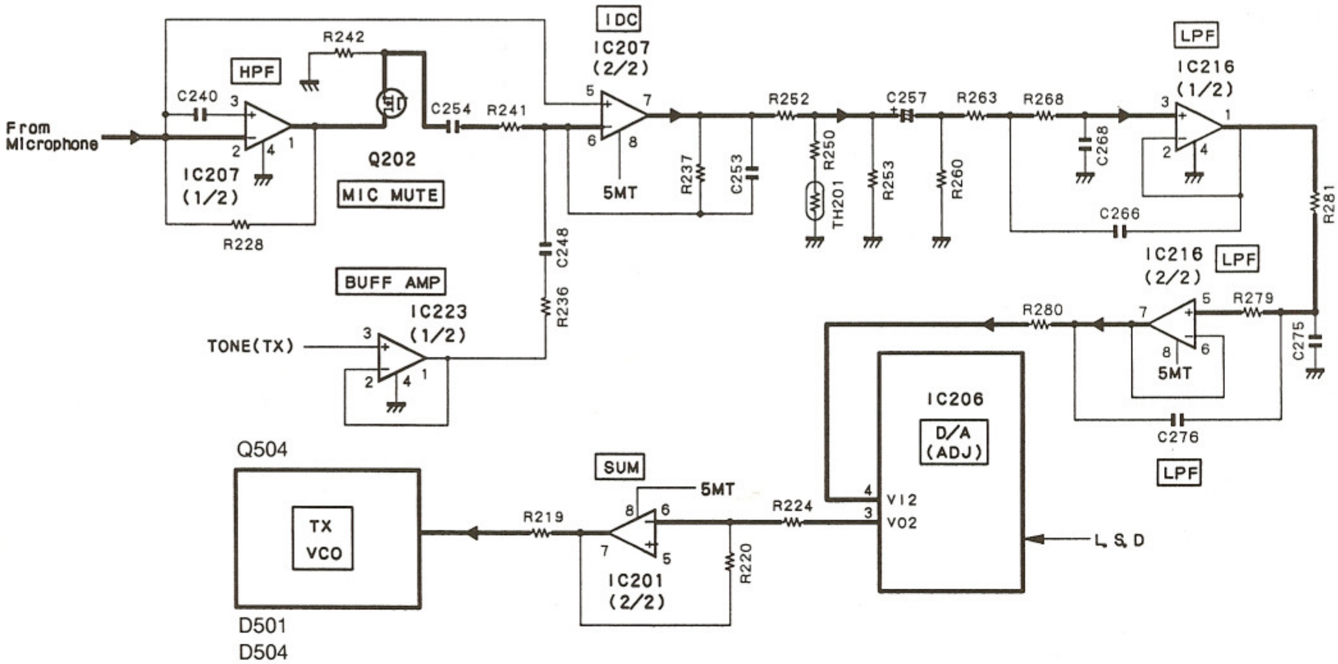


Fig. 4 Microphone amplifier , modulator

CIRCUIT DESCRIPTION

4.3 Driver and final power amplifier

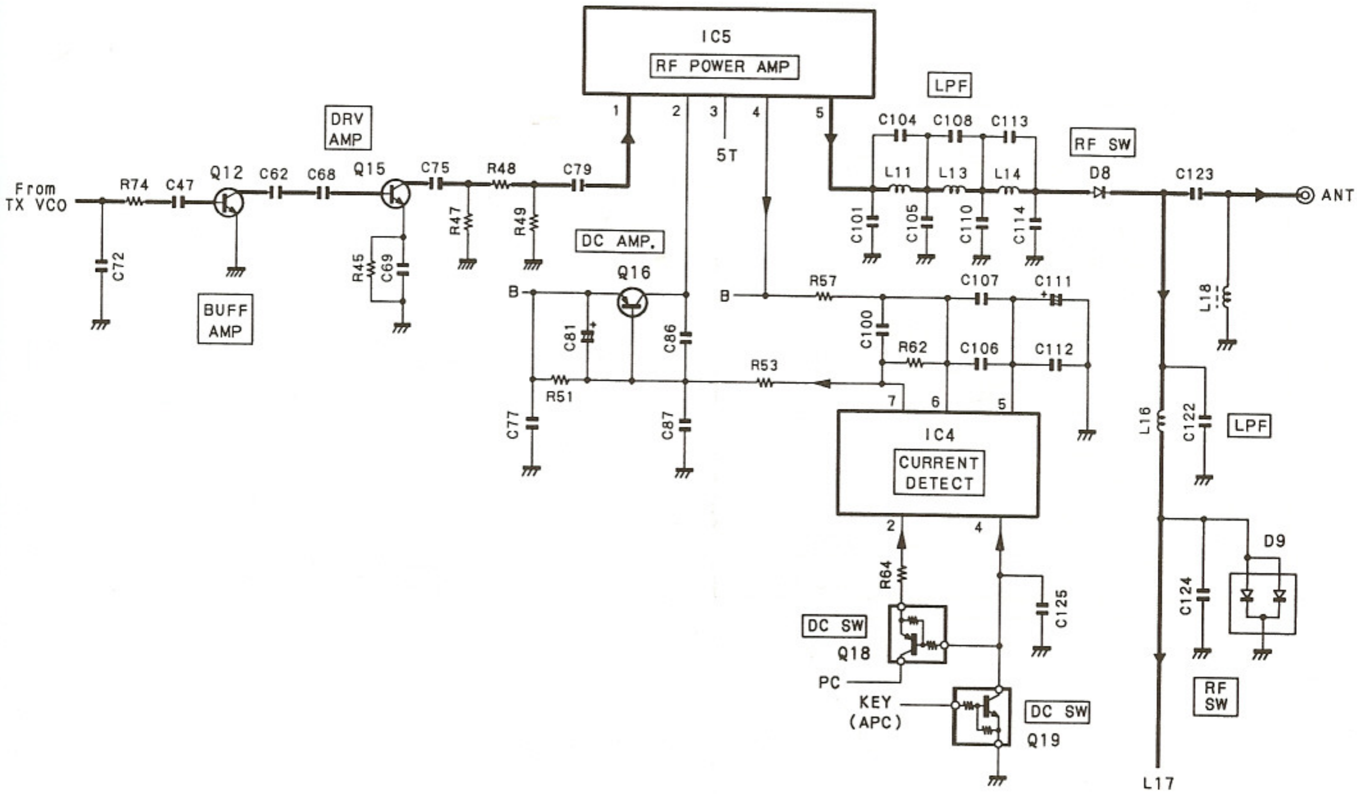
The transmit signal is directly generated by the VCO. The transmit signal obtained from the VCO buffer amplifier Q12, is amplified by Q15, to approximately 2dBm. This amplified signal is passed to the power module(IC5). The power module consist of a 3-stage amplifier and is capable of producing up to 4.8W .

4.4 ANT switching

The power module output signal is passed through a 3-stage low-pass filter network and a transmit/receive switching circuit before it is passed to the antenna terminal. The transmit/receive switching circuit is comprised of D8 and D9. D8 and D9 are turned on (conductive) in transmit mode and turned off (isolated) in receive mode.

4.5 Automatic power control and transmitter output level switch

The automatic power control (APC) circuit stabilizes the transmitter output power at a pre-determined level by sensing the collector current of the final amplifier transistor in the power module. The voltage comparator (IC4) compares the voltage obtained by the above collector current with a reference voltage, set using the microprocessor and Q18. An APC voltage proportional to the difference between the sensed voltage and the reference voltage appears at the output of IC4. This output voltage controls Q16, which in turn controls the voltage at pin 2 of the power module, which keeps the transmitter output power constant. The transmitter output power can be varied to 1W or 2W by the microprocessor, which in turn changes the reference voltage of IC4, and hence the output power.



(Drive and final power amplifier, ANT switching, APC and transmitter output level switch)

Fig. 5 Transmit power system

5. PLL FREQUENCY SYNTHESIZER

5.1 PLL

The frequency step of the PLL circuit is 5 or 6.25kHz. A 12.8MHz reference oscillator signal is divided at IC3 by a fixed counter to produce the 5 or 6.25kHz reference frequency. The VCO output signal is buffer amplified by Q13, then divided in IC3, by a dual-modules programmable counter in this case. The divided signal is compared in phase with the 5 or 6.25kHz reference signal in the phase comparator also in IC3. The output signal from the phase comparator is low-pass filtered and passed to the VCO to control the oscillator frequency.

5.2 Voltage controlled oscillator(VCO)

The operating frequency is generated by Q504 in transmit mode and Q505 in receive mode. The oscillator frequency is controlled by applying the VCO control voltage, obtained from the phase comparator , to the varactor diodes (D501 in transmit mode and D502 and D503 in receive mode). The T/R pin in set high in receive mode causing Q501 and Q502 to turn off Q504, and turn on Q505, and is set low for transmit mode. The outputs from Q504 and Q505 are amplified by Q503 and outputed to the buffer amplifiers.

5.3 Unlock detector

If a pulse signal appears at the LD pin of IC3, an unlock condition occurs , the DC voltage obtained from Q9 and Q11, causes the voltage applied to the UL pin of the microprocessor to go low. When the microprocessor detects this condition, the transmitter is disabled by ignoring the push-to-talk switch input signal.

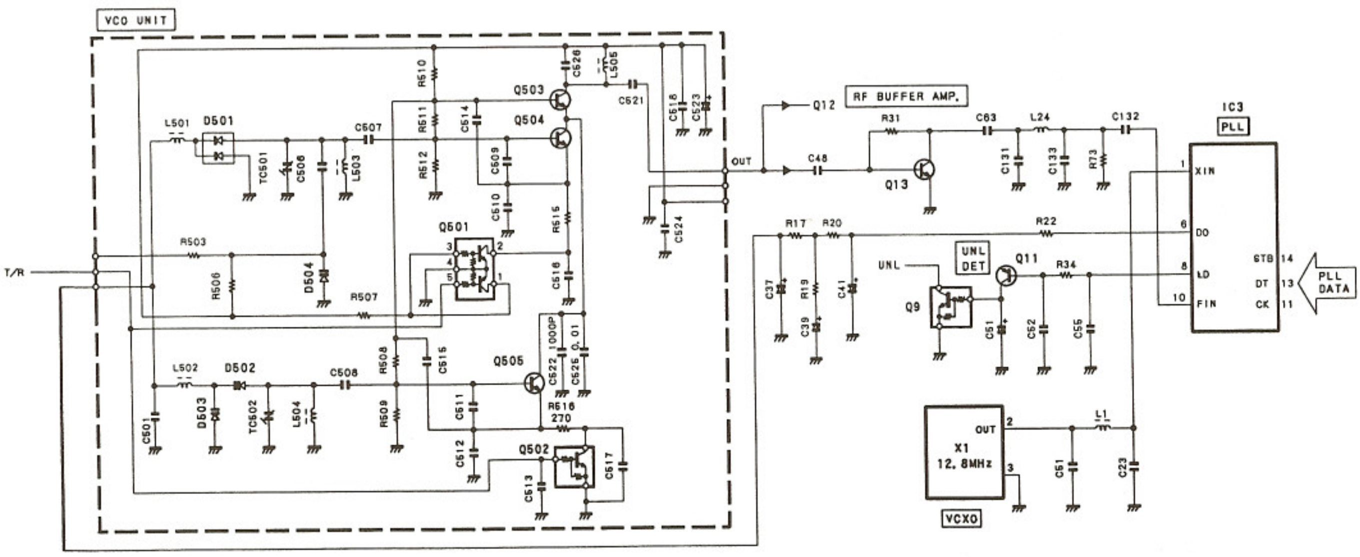


Fig .6 PLL frequency synthesizer

CIRCUIT DESCRIPTION

6. POWER SUPPLY CIRCUIT

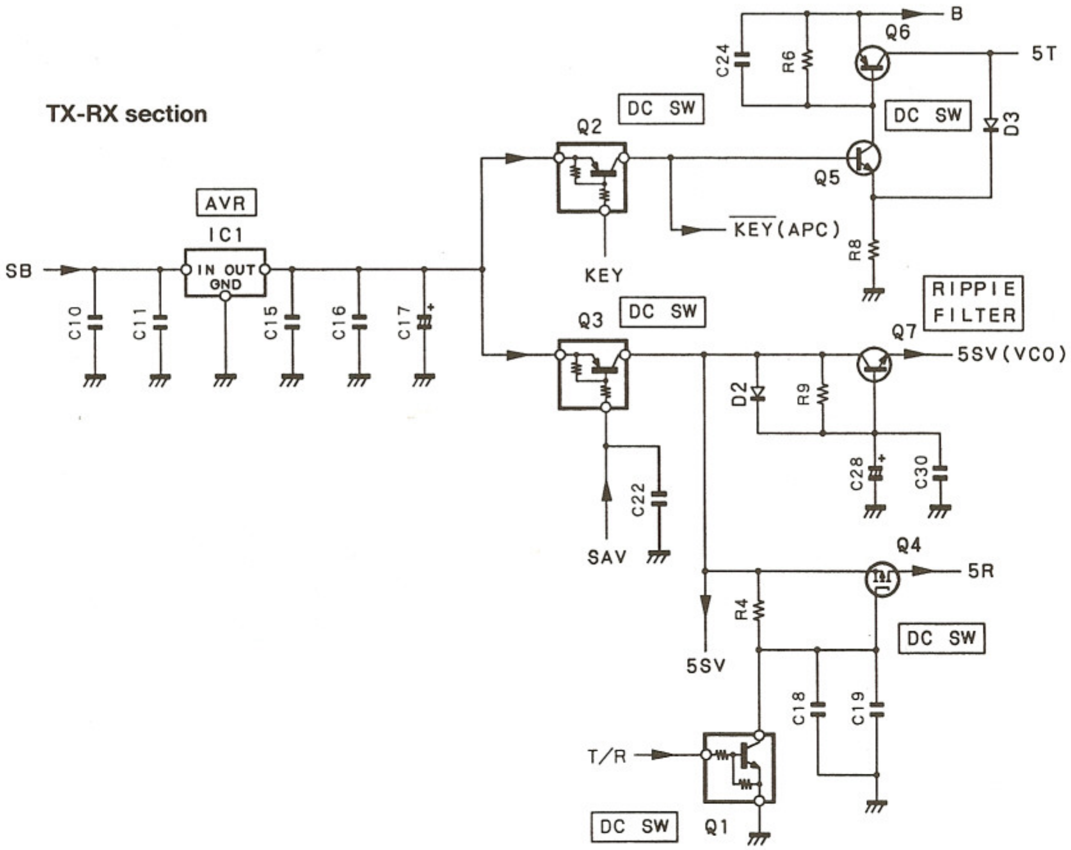
6.1 Power switching

A 5V reference voltage is derived from an external power supply or internal battery by IC1. This reference is used to provide a 5V supply in transmit mode [5T] , and a 5V supply in receive mode [5R] and a 5V supply common in both modes [5C] and [5SV] based on the control signal sent from the microprocessor or shift register. IC203 and IC204 in the control unit provide a 5V supply for the control and display circuits.

6.2 Battery saver

If no activity is detected(squelch closed) on the channel, the units enters into the battery save mode controlled by the microprocessor and shift registor. In this mode, SAVE line is set low, causing Q4 to disable [5SV].

TX-RX section



Power supply

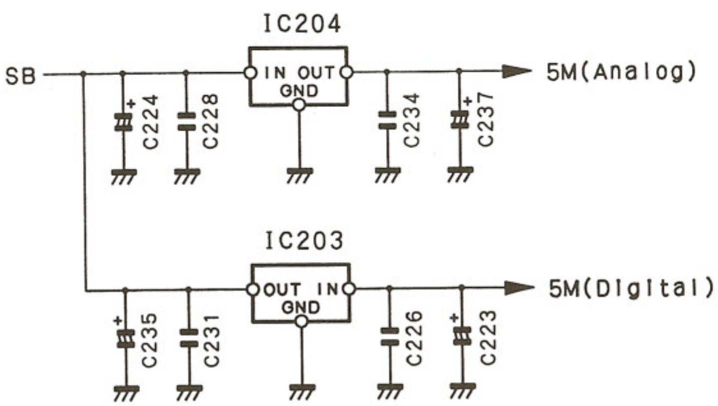


Fig .7 Power supply circuit
(Power switching, battery saver)

CIRCUIT DESCRIPTION

7. CONTROL UNIT

The control unit consists of microprocessor IC221 and its peripheral circuits. It controls the TX-RX unit and transfers data to and from the display section. The CPU (IC221) mainly performs the following :

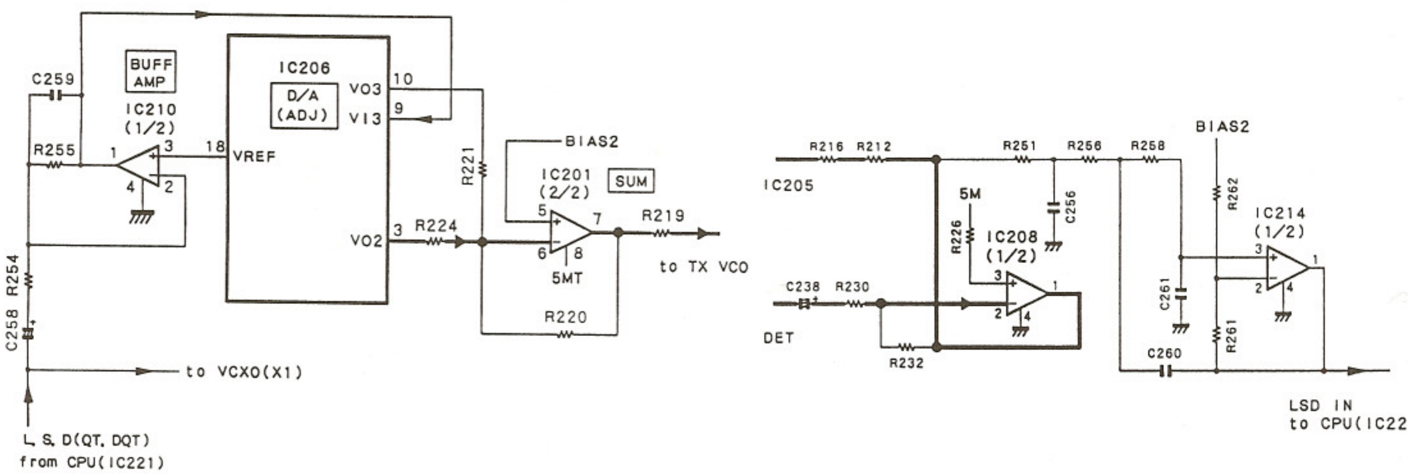
1) Switching between transmission and reception by PTT signal input.
2) Reading channel, frequency, and program data from IC212, 220.
3) Sending frequency program data to the PLL.
4) Controling squelch ON/OFF by the pulse signal input from the squelch circuit.
5) Controling the audio mute circuit by decode data input.
6) Transmiting encode data.(QT, DQT)
7) Sending serial data to output expander (IC213) to control various function in the unit.

7.1 QT, DQT encode

The QT, DQT encoder tone is set by the data from the microprocessor(IC221). The QT, DQT tones are applied to the VCO and VCXO (X1) after passing through the D/A convertor (IC206) for tone deviation adjustment and the summing amplifier (IC201).

7.2 QT,DQT decode

A part of the recovered audio signal obtained at the amplifier IC208 (1/2) are the QT and DQT tones and are low pass filtered by IC214 (1/2) and passed to the microprocessor for decoding.



Encode circuit

Decode circuit

Fig. 8 QT, DQT encode, decode

7.3 CPU clock shift

When the CPU (IC221) 12MHz clock (X202) high frequency (actually the integral double high frequency of 6MHz because it is halved) is multiplexed with the reception frequency, it becomes an internal beat signal, supressing the signal sensitivity. To prevent this, by turning Q209 ON, the clock frquency is shifted (about 4kHz).

(Shift ON/OFF can be set through programming.)

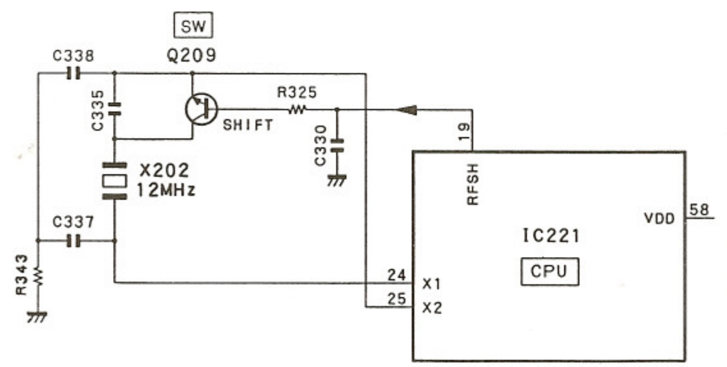


Fig. 9 CPU clock frequency shift

CIRCUIT DESCRIPTION

8. DISPLAY CIRCUIT

The display circuit consists of the CPU, LCD, and peripheral circuits. The CPU (IC451) mainly controls the following functions :

1) Transmitting the ON/OFF serial data signal from the SCAN switch, D/A switch, TA switch, LO switch and rotary encoder (channel selector) to the control unit.
2) Receiving the serial data signal from the control unit and displaying the data on the LCD. The LCD contains the 13-segment display and BUSY, CALL, SCAN, and other indicators. Controls the LEDs (TX, BUSY LAMP).
3) When the power is initially turned on, the reset circuit (IC452) resets both the display CPU (IC451) and the main CPU (IC221).

9. DTMF

9.1 DTMF encode

Once a signal is passed from the DTMF keypad to the microprocessor. The microprocessor passes this information to the DTMF encoder (IC219) for encoding. The encoded signal is then passed to IC206 (D/A convertor) for DTMF deviation adjustment. This signal provides a TX DTMF tone and a RX DTMF tone. The TX DTMF tone is passed to the pre-emphasis circuit (mic. amplifier) and then to the VCO. The RX DTMF tone is passed to the de-emphasis circuit, audio power amplifier and then to the speaker.

9.2 DTMF decode

The DTMF input signal from the DET line passes through the low pass filter (IC205 2/2) and is then passed to IC218, DTMF decoder. The decoded information is then processed by the microprocessor.

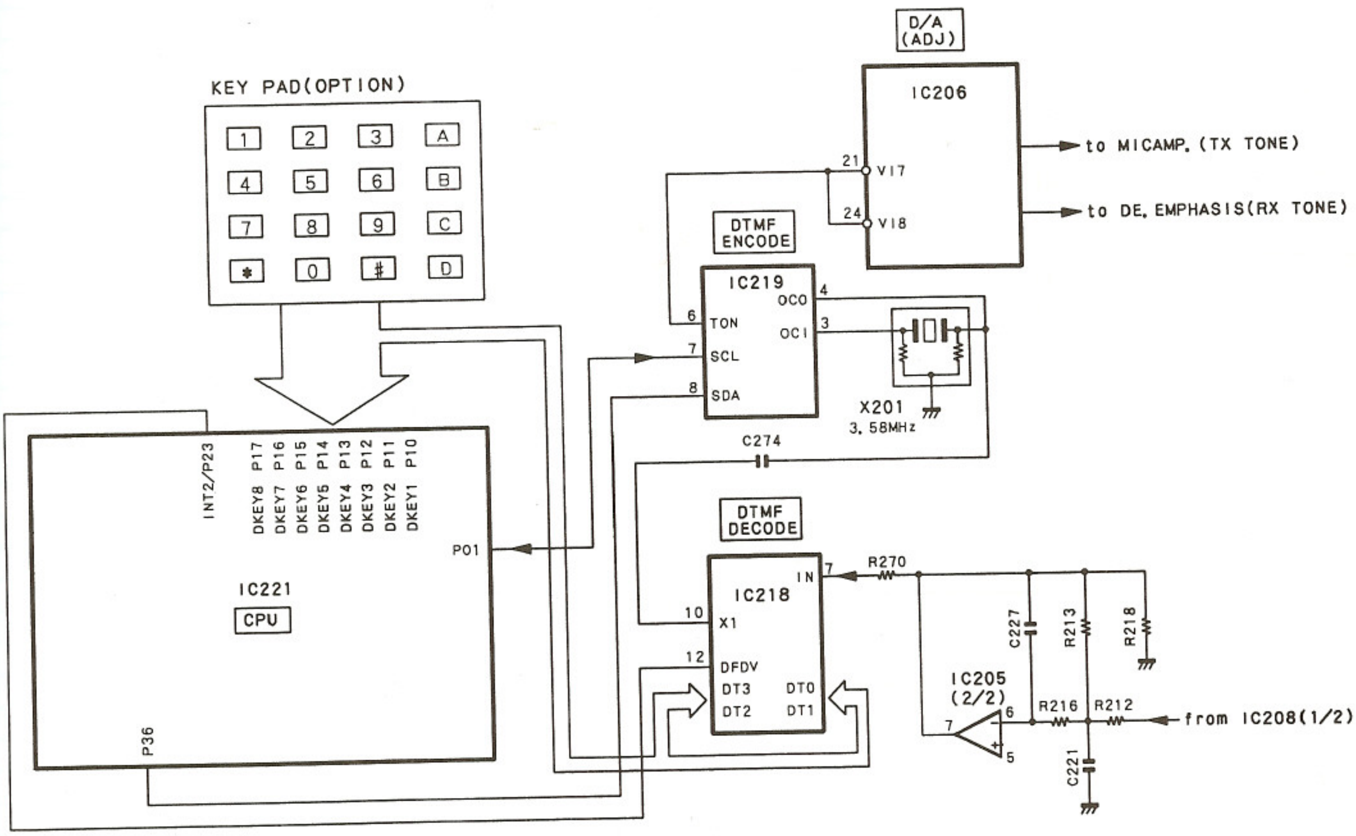
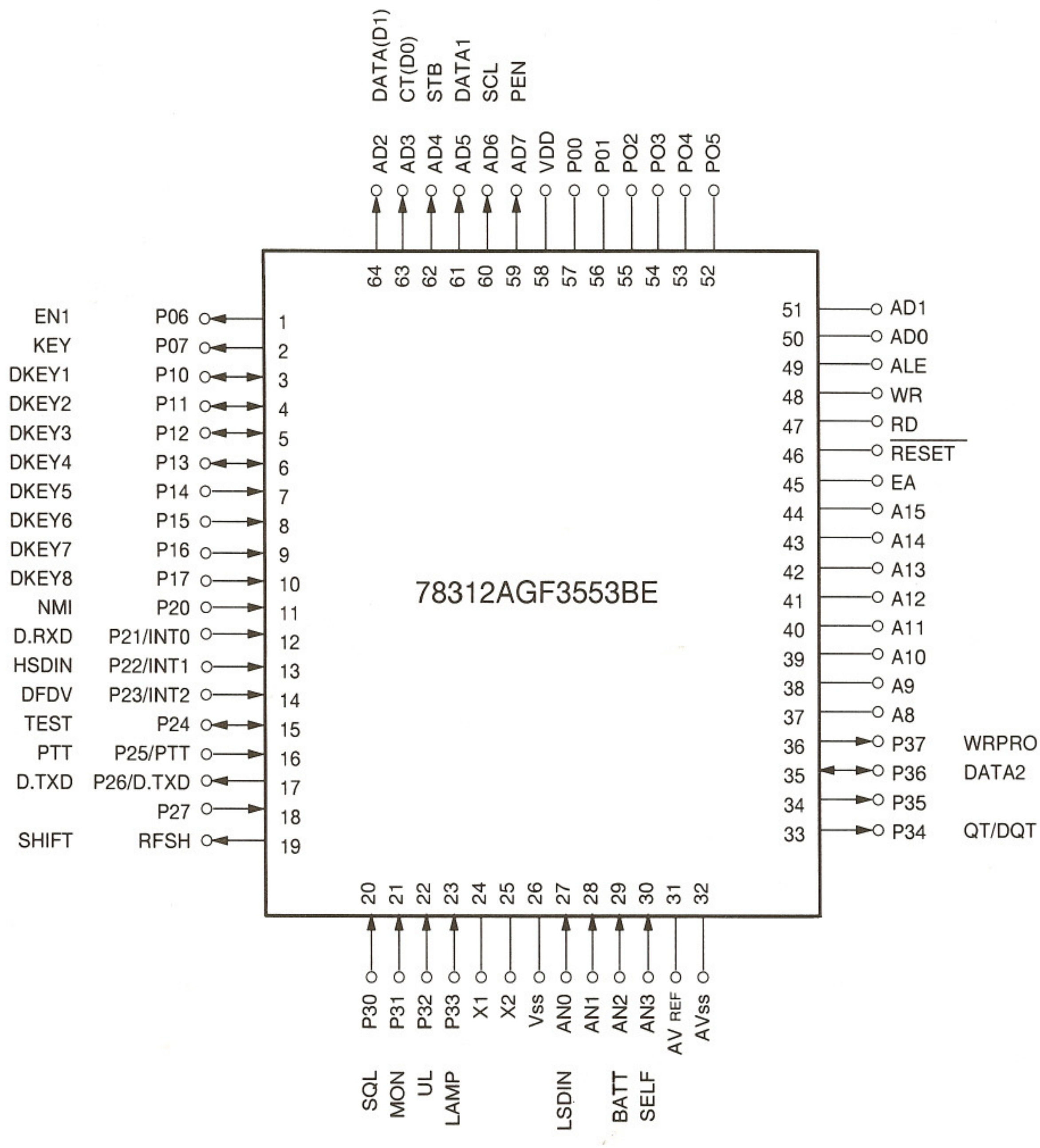


Fig. 10 DTMF. encode, decode

SEMICONDUCTOR DATA

Main microprocessor: 78312AGF3553BE (IC221)

● **Pin connection**



SEMICONDUCTOR DATA

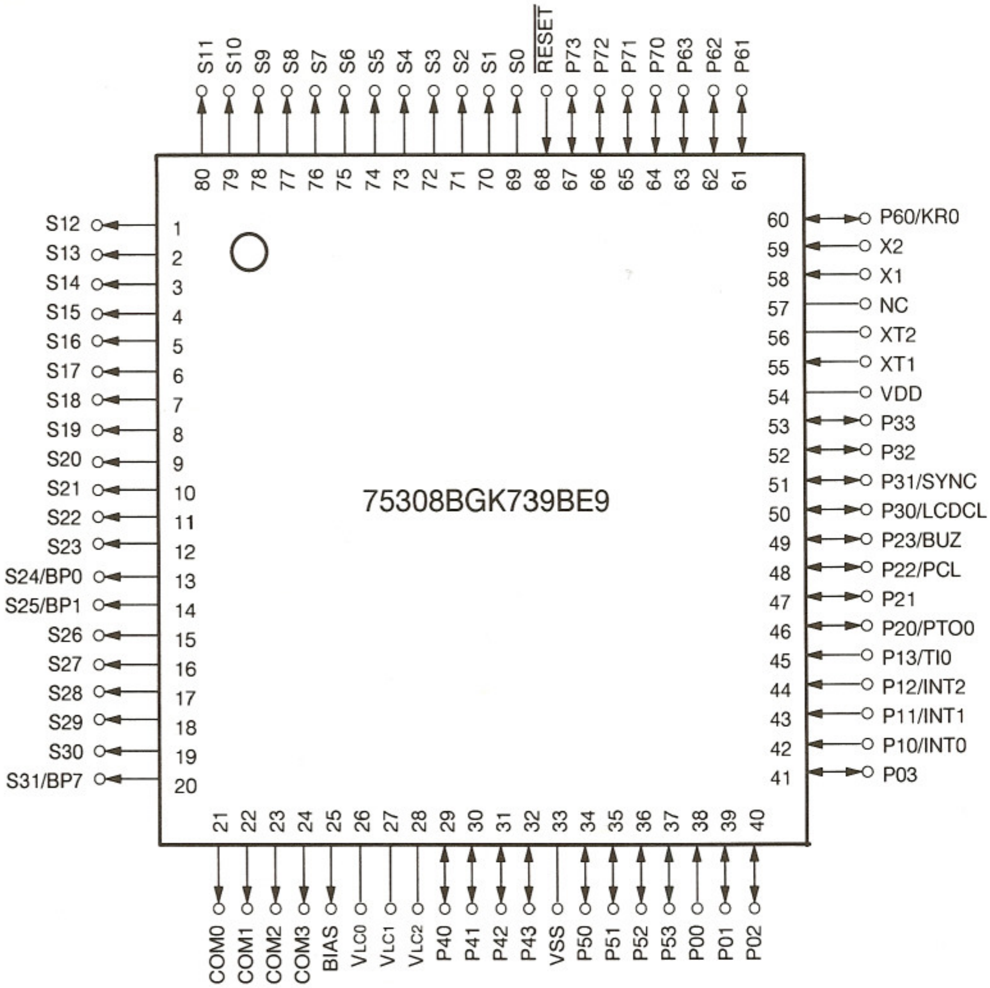
● **Pin function**

Pin No.	Pin Name	Port Name	I/O	Function
1	P06	EN1	O	D/A converter enable output.
2	P07	KEY	O	T/R (Transmit Active "Low").
3	P10	DKEY1	I/O	Key Pad Row-1.
4	P11	DKEY2	I/O	Key Pad Row-2.
5	P12	DKEY3	I/O	Key Pad Row-3.
6	P13	DKEY4	I/O	Key Pad Row-4.
7	P14	DKEY5	I	Key Pad Column-4/DTMF Decode data-0.
8	P15	DKEY6	I	Key Pad Column-3/DTMF Decode data-1.
9	P16	DKEY7	I	Key Pad Column-2/DTMF Decode data-2.
10	P17	DKEY8	I	Key Pad Column-1/DTMF Decode data-3.
11	P20	NMI	I	GND.
12	P21/INT0	D RXD	I	For display serial (RX) data input.
13	P22/INT1	HSDIN	I	High speed decode deta input.
14	P23/INT2	DFDV	I	DTMF decode detect input.
15	P24	TEST	I/O	Data output with programming.
16	P25/PTT	PTT	I	PTT/program RXD.
17	P26/D.TXD	D TXD	O	For display serial (TX) data output.
18	P27		I	GND.
19	RFSH	SHIFT	O	System clock shift control output.
20	P30	SQL	I	Noise pulse input.
21	P31	MON	I	MONI switch input.
22	P32	UL	I	PLL unlock detect input.
23	P33	LAMP	I	LAMP switch input.
24	X1		—	12.000MHz (system clock).
25	X2		—	12.000MHz (system clock).
26	V_{SS}		—	GND.
27	AN0	LSDIN	I	Low speed data input.
28	AN1		I	Open (not used).
29	AN2	BATT	I	BATT check input.
30	AN3	SELF	I	SELF programming protect input.
31	AV_{REF}		—	+5V.
32	AV_{SS}		—	GND.
33	P34	QT/DQT	O	Low speed data (signalling) output.
34	P35		O	Open (not used).
35	P36	DATA2	I/O	Serial E^2PROM data output / input / Tone generater data output.
36	P37	WRPRO	O	Parallel E^2PROM write protect output.
37~44	A8~A15		—	A8~A15 address bus.
45	$\overline{EA}$		—	External access.
46	$\overline{RESET}$		—	Power on reset.
47	$\overline{RD}$		—	Read [bus].
48	$\overline{WR}$		—	Write [bus].
49	ALE		—	Address latch.
50~57	AD0 ~AD7		—	AD0~AD7 address/data bus.
58	V_{DD}		—	GND.
59	P00	PEN	O	PLL enable output.
60	P01	SCL	O	Serial clock output.
61	P02	DATA1	O	PLL data output / Shift register data output / D/A converter data output.
62	P03	STB	O	Shift register strobe output.
63	P04	CT (D0)	O	Voice scrambler data output.
64	P05	DATA (D1)	O	Voice scrambler data output.

SEMICONDUCTOR DATA

Display microprocessor: 75308BGK739BE9 (IC451)

● **Pin connection**



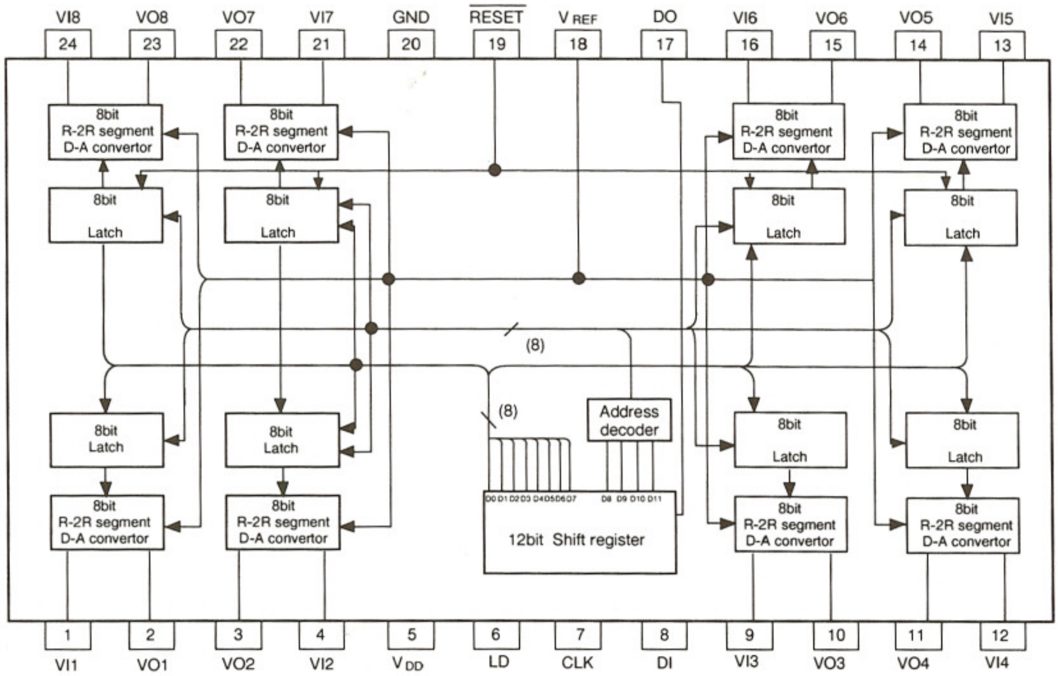
● **Pin function**

Pin No.	Pin Name	I/O	Function	Pin No.	Pin Name	I/O	Function
1~20	S12~S31	O	LCD output (S20~S0).	46~49	P20~P23	—	Open (not used).
21	COM0	O	LCD COM0.	50	P30	O	Serial (RX) data output.
22	COM1	O	LCD COM1.	51, 52	P31, 32	—	Open (not used).
23	COM2	O	LCD COM2.	53	P33	O	LAMP LED output.
24	COM3	O	LCD COM3.	54	V_{DD}	—	+5V.
25	BIAS	O	LCD power supply voltage.	55	XT1	—	+5V.
26~28	V_{LC0}~V_{LC2}	—	LCD voltage level generator.	56	XT2	—	Open (not used).
29~32	P40~P43	—	Open (not used).	57	NC	—	Open (not used).
33	V_{SS}	—	GND.	58, 59	X1, X2	I	System clock input.
34	P50	O	GREEN LED output.	60	P60	I	GND.
35	P51	O	RED LED output.	61	P61	O	Reset output.
36, 37	P52, P53	—	Open (not used).	62, 63	P62, 63	—	Open (not used).
38-40	P00~P02	I	GND.	64	P70	I	LO switch input.
41	P03	I	Rotary encoder input.	65	P71	I	TA switch input.
42	P10	I	Rotary encoder input.	66	P72	I	D/A switch input.
43	P11	I	Serial (TX) data input.	67	P73	I	SCN switch input.
44	P12	I	GND.	68	$\overline{RESET}$	I	Power on reset input.
45	P13	O	Test output.	69~80	S0~S11	—	Open (not used).

SEMICONDUCTOR DATA

D/A converter : M62363FP (IC206)

● Block diagram



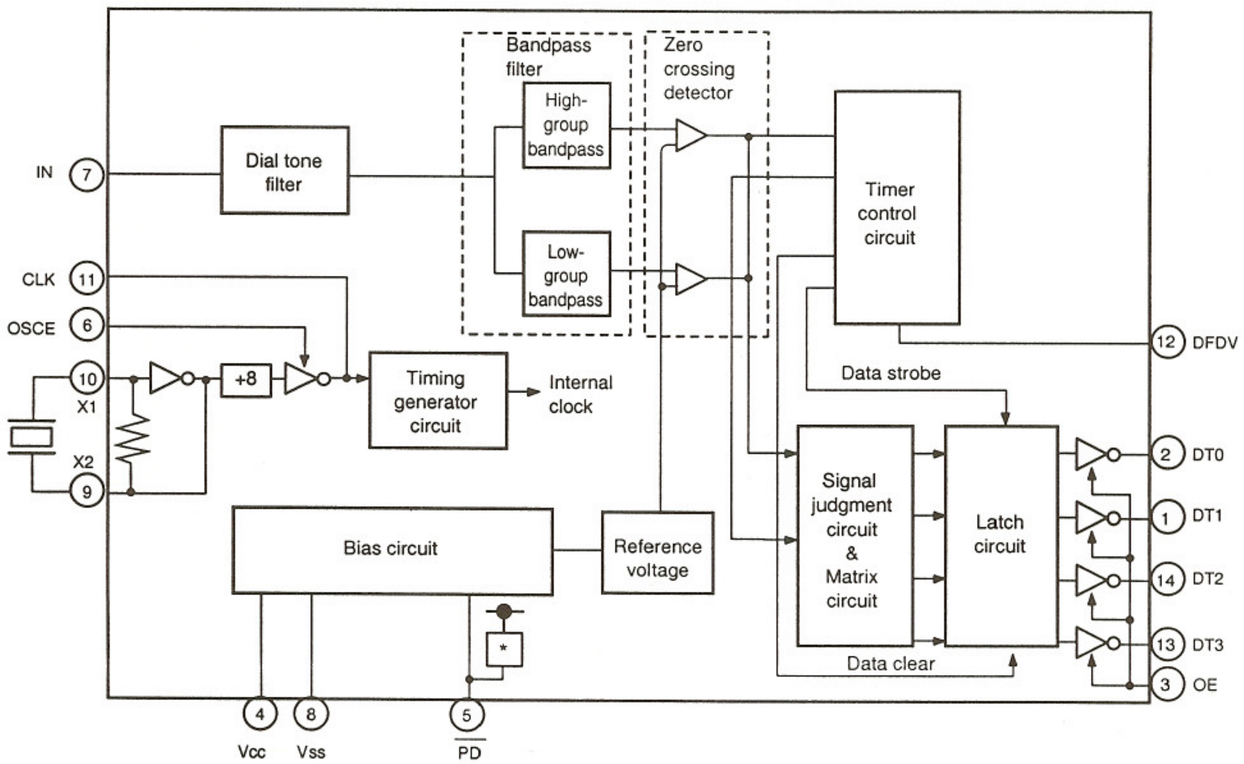
● Pin function

Pin No.	Pin code	I/O	Function
1	V I1	I	D/A converter input terminal
2	VO1	O	8-bit resolution D/A terminal
3	VO2	O	8-bit resolution D/A terminal
4	V I 2	I	D/A converter input terminal
5	VDD	-	Power supply terminal
6	LD	I	When the LD terminal is at the Low level, the clock input reception mode is entered, and data can be uptaken by the 12-bit shift register. Then at the threshold rising from Low to High, the 12-bit shift register value is loaded to the D/A output register.
7	CLK	I	Shift clock input terminal. With the rise of the shift clock, the input signal from the DI terminal is input to the 12-bit shift register.
8	DI	I	serial data input terminal. Input serial data 12 bits long.
9	V I 3	I	D/A converter input terminal
10	VO3	O	8-bit resolution D/A terminal
11	VO4	O	8-bit resolution D/A terminal
12	V I 4	I	D/A converter input terminal
13	V I 5	I	D/A converter input terminal
14	VO5	O	8-bit resolution D/A terminal
15	VO6	O	8-bit resolution D/A terminal
16	V I 6	I	D/A converter input terminal
17	DO	O	12-bit shift register MSB bit data is output.
18	VREF	-	Terminal for determining the D/A conversion reference point level $V_o = (V_{IN} - V_{DAref}) \times n/256 + V_{DAref}$
19	RESET	-	When a Low level signal is input to the RESET terminal, all the D/A output register value become Low.
20	GND	-	GND terminal
21	V I 7	I	D/A converter input terminal
22	VO7	O	8-bit resolution D/A terminal
23	VO8	O	8-bit resolution D/A terminal
24	V I 8	I	D/A converter input terminal

SEMICONDUCTOR DATA

DTMF decoder : TC35305P/F(IC218)

● **Internal bock diagram**



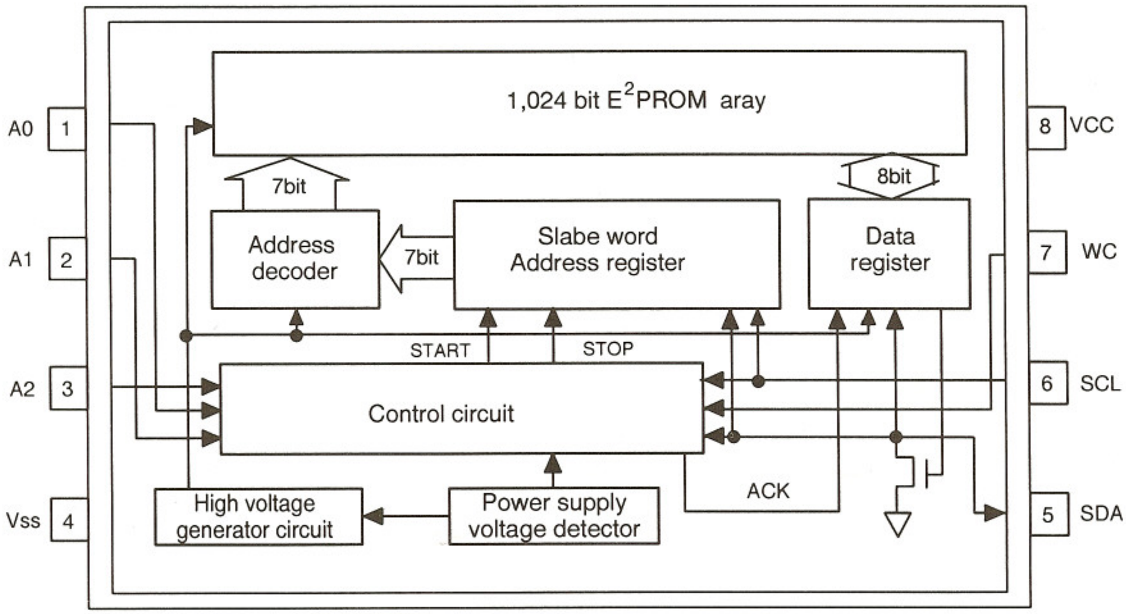
● **Pin function**

Pin No.	Pin Name	I/O	Function
1	DT1	O	Reception data output terminal. OE = " L " ; high impedance OE = " H " ; output as the 4-bit code .
2	DT0	O	
3	OE	I	D1~D4 3-state control terminal. OE = " H " ; enable OE = " L " ; high impedance
4	Vcc	-	Power supply terminal (normally 5V)
5	$\overline{PD}$	I	Enters standby mode when " L " is applied.
6	OSCE	I	Oscillation stage control terminal.
7	IN	I	Signal input terminal.
8	Vss	-	Power supply terminal.(Nrmally 0V)
9	X2	O	3.579545MHz quartz crystal.
10	X1	I	3.579545MHz quartz crystal. Connected to VDD when using an external clock.
11	CLK	I/O	OSCE = " H " ; external clock output OSCE = " H " ; external clock input
12	DFDV	O	Becomes " H " when an effective tone pair continues for the stipulated period and is detected.
13	DT3	O	Reception data output terminal. OE = " L " ; high impedance OE = " H " ; output as the 4-bit code .
14	DT2	O	

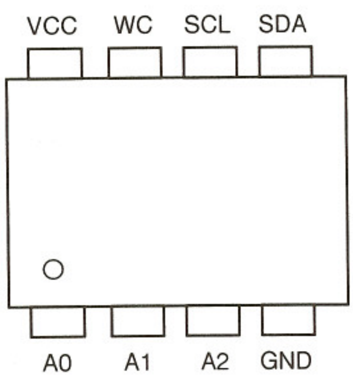
SEMICONDUCTOR DATA

E²PROM : XL24C01AF (IC220)
: BR24C01AF(IC220)

● **Bock diagram**



● **Pin layout**



● **Pin function**

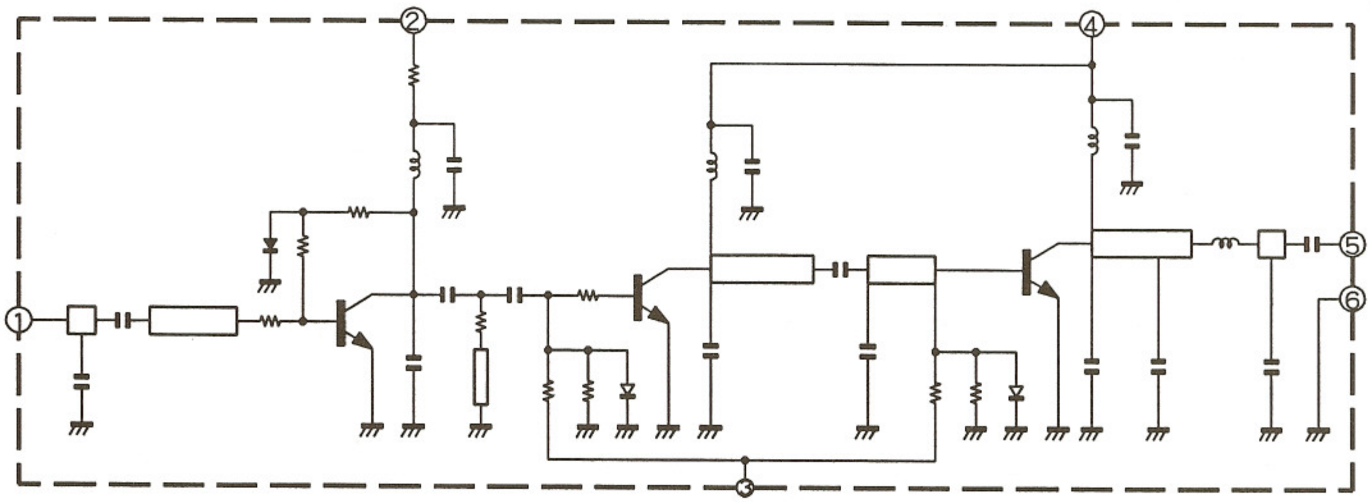
Pin No.	Pin Name	I/O	Function
1~3	A0•A1•A2	I	Slave address setting(terminal)
4	Vss	-	Reference voltage for all I/O,0V.
5	SDA	I/O	slave and word address, serial data in-put/output
6	SCL	I	Serial clock input
7	WC	I	Connect to GND
8	VCC	-	Connect to the power supply.

- The SDA terminal is the N ch open drain output, so use with a pull-up resistor attached to the outside.

SEMICONDUCTOR DATA

Power module : M67755HA(K, M, T, E)
M67755LA(K2, M2)

● **Equivalent circuit diagram**



Electrode configuration
1. Input terminal
2. First power supply terminal
3. Base bias power supply terminal
4. End power supply terminal
5. Output terminal
6. Fin (earth)

DESCRIPTION OF COMPONENTS

TX-RX UNIT: TX-RX section (X57-4440-10) A/3

Ref. No.	Parts No.	Description
IC1	NJU7201U50	Voltage Regulator 5V
IC2	MC3372V	IF system
IC3	MB1512PFV-G-BND	Phase locked loop system
IC4	NJMI458M	Current detector (APC)
IC5	M67755HA(K,M) M67755LA(K2,M2)	RF Power amp.
Q1	DTC144EE	DC switch
Q2	DTA114YE	DC switch
Q3	DTA123JE	DC switch
Q4	2SJ243	DC switch
Q5	2SC4617 (S)	DC switch
Q6	2SB1119 (S)	DC switch
Q7	2SC4617 (S)	Ripple filter
Q8	2SK208(O)	Buffer amp.
Q9	DTC143EE	PLL unlock detector
Q10	2SC4215 (Y)	IF amp.
Q11	2SA1832(GR)	PLL unlock detector
Q12	2SC5090	RF buffer amp.
Q13	2SC5066(O)	RF buffer amp.
Q14	SGM2014M	Mixer
Q15	2SC4226(R24)	RF amp. TX driver
Q16	2SB1119 (S)	DC amp.
Q17	2SK1215(E)	RF amp.
Q18	DTA123JE	DC switch
Q19	DTC144EE	DC switch
Q20	2SC4617 (S)	Temprature protection
D1	D1F20	Reverse polarity protection
D2	1SS368	Current steering
D3	1SS368	Current steering
D4, D5	HVU350	Varactor tuning
D6	HVU350	Varactor tuning
D7	HVU350	Varactor tuning
D8	MI809	RF switch
D9	1SS312	RF switch
D10	HSM88AS	Overload protection

TX-RX UNIT: Control section (X57-4440-10) B/3

Ref. No.	Parts No.	Description
IC201	TA75W01FU	Buffer amp., Suming amp.
IC202	TC7S66FU	Audio mute switch
IC203	NJU7201U50	Voltage Regulator 5V
IC204	NJU7201U50	Voltage Regulator 5V
IC205	TA75W01FU	Active filter
IC206	M62363FP	D/A Converter (Adjustment)
IC207	TA75W558FU	Active filter,Limitter
IC208	MC33172D	Audio amp., Active filter
IC209	TC74VHC573FS	Address latch
IC210	TA75W01FU	Buffer amp., DC shift
IC211	TA75W01FU	Active filter, Audio amp.
IC212	HN58C257T-20	E^2PROM
IC213	XRU4094BCFV or BU4094BCFV	Shift registor
IC214	TA75W01FU	Active filter, Audio amp.

DESCRIPTION OF COMPONENTS

Ref. No.	Parts No.	Description
IC215	TC7S32FU	Address decoder
IC216	TA75W01FU	Active filter
IC217	TC7S04FU	Address decoder
IC218	TC35305F	DTMF decoder
IC219	PCD3312CT	TONE (DTMF) encoder
IC220	XL24C01AF or BR24C01AF	E^2PROM
IC221	78312AGF3553BE	Microprocesser
IC222	TA7368F	Audio power amp.
IC223	TA75W01FU	Buffer amp.
Q201	2SJ243	DC switch
Q202	2SK1824	Audio mute switch
Q203	DTC144EE	DC switch
Q204	2SA1586 (Y, GR)	Audio mute switch
Q205	DTC144EE	DC switch
Q206	DTC144EE	DC switch
Q207	DTC144EE	DC switch
Q208	2SA1362 (GR)	DC switch
Q209	2SC4215 (Y)	Clock frequency shift
Q210	2SK1588	Audio mute switch
Q211	DTA144EE	DC switch
Q212	2SK879(Y)	MIC AMP level control
D202	DA221	Voltage clamp
D203	DA221	Voltage clamp
D204	DA221	MIC AMP detection

TX-RX UNIT: Display section (X57-4440-10) C/3

Ref. No.	Parts No.	Description
IC451	75308BGK739BE9	Microprocesser (display)
IC452	S-8054ALB-LM-T1	Reset Switch
D451	B30-2019-05	Red, green (LED)
D452	B30-2047-05	LCD back light

VCO UNIT (X58-4130-10)

Ref. No.	Parts No.	Description
Q501	UMG2	DC switch
Q502	DTC144EE	DC switch
Q503	2SC5090	RF buffer amp.
Q504	2SC4226 (R24)	VCO oscillator
Q505	2SC4226 (R24)	VCO oscillator
D501	1SV228	VCO voltage control
D502	1T363A	VCO voltage control
D503	1T363A	VCO voltage control
D504	MA360	TX modulation

PARTS LIST

∗New Parts. ⚠ indicates safety critical components.
Parts without **Parts No.** are not supplied.
Les articles non mentionnes dans le **Parts No.** ne sont pas fournis.
Teile ohne **Parts No.** werden nicht geliefert.

L : Scandinavia **K** : USA **P** : Canada
Y : PX (Far East, Hawaii) **T** : England **E** : Europe
Y : AAFES (Europe) **X** : Australia **M** : Other Areas

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
TK-250					
1	2C		A02-1829-01	PLASTIC CABINET	
3	3B		A13-1611-12	FRAME	
4	1D		A21-1544-03	DRESSING PANEL ACCESSORIES	
6	2D		A40-0635-13	BOTTOM PLATE	
7	3A		A62-0345-04	PANEL ASSY	
10	2C		B09-0344-03	CAP ACCSSSORIES	
11	3C		B42-3394-14	STANDARD LABEL	K,K2
12	2C		B43-1100-04	KENWOOD BADGE	
13			B46-0409-40	WARRANTY CARD ACCESSORIES	K,K2
14			B62-0446-00	INSTRUCTION MANUAL (EN,SP,FR)	
15	3D		B72-0706-14	MODEL NAME PLATE	K,M
15	3D		B72-0707-14	MODEL NAME PLATE	K2,M2
15	3D	*	B72-0844-14	MODEL NAME PLATE	T
15	3D	*	B72-0923-04	MODEL NAME PLATE	E
16	3B		E04-0192-05	RF COAXIAL CABLE RECEPTACLE	
17	2B,2D		E23-0474-14	BATTERY TERMINAL OUT SIDE	
18	2B		E23-0966-04	BATTERY TERMINAL IN SIDE	
19	2B		E23-0998-04	GRAND TERMINAL POWER MODULE	
20	2B		E37-0435-05	FLAT CABLE TX-RX CN1-CN201	
21	1B		E37-0437-05	LEAD WIRE WITH CONNECTOR SP	
25	2B		F10-2112-02	SHIELDING COVER TX-RX	
26	3B		F10-2113-23	SHIELDING PLATE TX-RX	
27	1B		F10-2114-03	SHIELDING PLATE CONTROLE	
28	2B		F10-2115-04	SHIELDING PLATE POWER MODULE	
30	2D		G01-0867-04	COIL SPRING LEVER KNOB	
32	2B,2D		G11-0617-04	CUSHION BATT TERMINAL	
33	2B		G53-0742-14	PACKING HOLDER	
34	2A		G53-0766-03	PACKING SPEAKER/MIC	
35	3A		G53-0767-04	PACKING PANEL	
36			H52-0560-04	ITEM CARTON CASE	
37			H12-1470-02	PACKING FIXTURE	
38			H25-0029-04	PROTECTION BAG 60X110	
39			H25-0085-04	PROTECTION BAG 100X200	
40	2B		J19-1525-04	HOLDER	
43	1B		J21-4461-03	HARDWARE FIXTURE SPEACER	
44	2C		J21-4462-04	HARDWARE FIXTURE ACCESSORIES	
45	1C		J21-4463-04	HARDWARE FIXTURE ACCESSORIES	
46	2C		J21-4464-14	HARDWARE FIXTURE PTT	
47	2D		J21-4474-04	HARDWARE FIXTURE PTT	
50	3D	*	J29-0616-23	HOOK ACCESSORIES	
52	1B		J39-0604-04	SPACER MIC	
54	3A		J69-0321-05	RING CH,VOL	
55	2D		J69-0330-05	RING BOTTOM PLATE	
56	3A		J69-0331-05	RING ANTENNA	
58	3B		J82-0032-35	FLAT CABLE PTT-CN202	
59	2A		J82-0033-05	FLAT CABLE VOL,CH-CN205,CN451	
61	1D		J99-0337-04	ADHESIVE TAPE ACCESSORIES	
65	2D		K29-4800-04	KNOB RELEASE	
66	2D		K29-4917-02	KNOB PTT	
67	3A		K29-4918-03	KNOB VOLUME	
68	3A		K29-4919-03	KNOB KEY TOP	
69	3A		K29-4920-03	KNOB CHANNEL SELECTOR	

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
A	3B		N09-1492-05	PAN HEAD SCREW M2.6X3.5 BLK	
B	2B,3B		N09-2053-05	SEMS SCREW M2X3.5	
C	2D		N09-2185-05	BINDING HEAD SCREW M2.6X8	
D	3A		N14-0545-04	CIRCULAR NUT CH,VOL	
E	3A		N14-0560-04	CIRCULAR NUT ANTENNA	
F	3B		N14-0562-04	CIRCULAR NUT CH,VOL(BOTTOM)	
G	2D		N17-1026-60	TOOTHED LOCK WASHER	
H	1B,3B		N39-2020-46	PAN HEAD MACHINE SCREW	
J	3B		N78-2080-46	PAN HEAD TAPTITE SCREW	
K	1B,2B		N09-2251-05	PAN HEAD TAPTITE SCREW	
L	2B,3B		N88-2005-46	FLAT HEAD TAPTITE SCREW	
M	2C,3D		N99-0387-05	SCREW SET ACCESSORIES	
VR1	2A		R05-3471-05	POTENTIOMETER 10KA	
80			T90-0381-05	HELICAL ANTENNA 134-150MHz ACC	K2,M2
80			T90-0450-05	HELICAL ANTENNA 150-162MHz ACC	KMTE
SP201	1B		T07-0314-05	LOUDSPEAKER(FULLRANGE)	
EN1	2A		W02-1814-05	ENCODER CHANNEL SELECTOR	
TX-RX UNIT (X57-444X-XX) 0-10 : K,M 0-11:K2,M2 0-51:T 2-71:E					
101	3A		B11-1107-04	REFRECTOR LCD	
D451			B30-2019-05	LED RED/GREEN	
D452			B30-2047-05	LED BACK LIGHT	
LCD1	3A		B38-0717-05	DISPLAY ASSY LCD	
C2			CC73GCH1H101J	CHIP C 100PF J	
C3 -7			CK73GB1H102K	CHIP C 1000PF K	
C8			CC73GCH1H101J	CHIP C 100PF J	
C9			CK73GB1H471K	CHIP C 470PF K	
C10			CK73GB1H103K	CHIP C 0.010UF K	
C11			CK73GB1H471K	CHIP C 470PF K	
C12 ,13			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C14			CK73GB1H102K	CHIP C 1000PF K	
C15			CK73GB1H103K	CHIP C 0.010UF K	
C16			CK73GB1H471K	CHIP C 470PF K	
C17			C92-0519-05	CHIP-TAN 1.0UF 25WV	
C18			CK73GB1H103K	CHIP C 0.010UF K	
C19			CK73GB1H471K	CHIP C 470PF K	
C20			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C21			CC73GCH1H220J	CHIP C 22PF J	
C22			CK73GB1H103K	CHIP C 0.010UF K	
C23			CC73GCH1H220J	CHIP C 22PF J	
C24 -26			CK73GB1H103K	CHIP C 0.010UF K	
C27			CK73GB1C104K	CHIP C 0.10UF K	
C28			C92-0606-05	CHIP-TAN 4.7UF 10WV	
C29			CK73GB1C104K	CHIP C 0.10UF K	
C30 ,31			CK73GB1H103K	CHIP C 0.010UF K	
C32			CC73GCH1H101J	CHIP C 100PF J	
C33			CK73GB1H102K	CHIP C 1000PF K	
C34 ,35			CK73GB1H471K	CHIP C 470PF K	
C36			CC73GCH1H150J	CHIP C 15PF J	
C37			C92-0003-05	CHIP-TAN 0.47UF 25WV	
C38			CC73GCH1H180J	CHIP C 18PF J	
C39			C92-0606-05	CHIP-TAN 4.7UF 10WV	
C40			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C41			C92-0502-05	CHIP-TAN 0.33UF 35WV	

PARTS LIST

TX-RX UNIT (X57-444X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
C42			CK73GB1H103K	CHIP C 0.010UF K	
C43 ,44			CK73GB1H102K	CHIP C 1000PF K	
C45			CK73GB1H103K	CHIP C 0.010UF K	
C47			CC73GCH1H220J	CHIP C 22PF J	
C48			CC73GCH1H100D	CHIP C 10PF D	
C49			CK73GB1H103K	CHIP C 0.010UF K	
C50			CK73GB1H102K	CHIP C 1000PF K	
C51			C92-0519-05	CHIP-TAN 1.0UF 25WV	
C52			CK73GB1H102K	CHIP C 1000PF K	
C53			CC73GCH1H101J	CHIP C 100PF J	
C54			CK73GB1H102K	CHIP C 1000PF K	
C55			CK73GB1H471K	CHIP C 470PF K	
C56			CC73GCH1H060D	CHIP C 6.0PF D	KMK2M2
C56			CC73GCH1H080D	CHIP C 8.0PF D	E
C56			CC73GCH1H120J	CHIP C 12PF J	T
C57			C92-0543-05	CHIP-TAN 3.3UF 10WV	K,M,T
C57			C92-0543-05	CHIP-TAN 3.3UF 10WV	K2,M2
C57			C92-0566-05	CHIP-TAN 10UF 6.3WV	E
C58 ,59			CK73GB1H103K	CHIP C 0.010UF K	
C60			CK73GB1C104K	CHIP C 0.10UF K	E
C60			CK73GB1H102K	CHIP C 1000PF K	K,M,T
C60			CK73GB1H102K	CHIP C 1000PF K	K2,M2
C61			CK73GB1H471K	CHIP C 470PF K	
C62			CC73GCH1H030C	CHIP C 3.0PF C	K,M
C62			CC73GCH1H040C	CHIP C 4.0PF C	T,E
C62			CC73GCH1H060D	CHIP C 6.0PF D	K2,M2
C63			CC73GCH1H220J	CHIP C 22PF J	
C64			CC73GCH1H100D	CHIP C 10PF D	T
C64			CC73GCH1H150J	CHIP C 15PF J	K,M,E
C64			CC73GCH1H150J	CHIP C 15PF J	K2,M2
C65			CK73GB1H103K	CHIP C 0.010UF K	
C66			CK73GB1H102K	CHIP C 1000PF K	
C67			CK73GB1H471K	CHIP C 470PF K	
C68			CC73GCH1H101J	CHIP C 100PF J	
C69			CK73GB1H102K	CHIP C 1000PF K	
C70 -72			CC73GCH1H101J	CHIP C 100PF J	
C73			CC73GCH1H050C	CHIP C 5.0PF C	K2,M2
C73			CC73GCH1H090D	CHIP C 9.0PF D	K,M
C73			CC73GCH1H180J	CHIP C 18PF J	T,E
C74			CC73GCH1H030C	CHIP C 3.0PF C	K,M
C74			CC73GCH1H040C	CHIP C 4.0PF C	T,E
C74			CC73GCH1H1R5C	CHIP C 1.5PF C	K2,M2
C75			CC73GCH1H100D	CHIP C 10PF D	K,M
C75			CC73GCH1H120J	CHIP C 12PF J	T,E
C75			CC73GCH1H150J	CHIP C 15PF J	K2,M2
C76			CC73GCH1H020C	CHIP C 2.0PF C	K2,M2
C76			CC73GCH1H030C	CHIP C 3.0PF C	KMTE
C77 -79			CK73GB1H102K	CHIP C 1000PF K	
C80			CC73GCH1H270J	CHIP C 27PF J	
C81			C92-0519-05	CHIP-TAN 1.0UF 25WV	
C82			C92-0578-05	CHIP-ELE 22UF 16WV	
C83 -87			CK73GB1H102K	CHIP C 1000PF K	
C88			CC73GCH1H020C	CHIP C 2.0PF C	
C89			CC73GCH1H220J	CHIP C 22PF J	KMTE
C89			CC73GCH1H270J	CHIP C 27PF J	K2,M2
C91			CC73GCH1H040C	CHIP C 4.0PF C	K2,M2
C91			CC73GCH1H2R5B	CHIP C 2.5PF B	KMTE
C92			C92-0536-05	CHIP-TAN 10UF 10WV	
C93			CK73GB1H102K	CHIP C 1000PF K	
C94			C92-0578-05	CHIP-ELE 22UF 16WV	
C95			CK73GB1H102K	CHIP C 1000PF K	
C96			CC73GCH1H1R5C	CHIP C 1.5PF C	
C97 ,98			CK73GB1H102K	CHIP C 1000PF K	
C99			CC73GCH1H270J	CHIP C 27PF J	
C100			CK73GB1C104K	CHIP C 0.10UF K	
C101			CC73FCH1H150J	CHIP C 15PF J	K2,M2
C101			CC73FCH1H270J	CHIP C 27PF J	KMTE
C102,103			CK73GB1H102K	CHIP C 1000PF K	
C104			CC73FCH1H150J	CHIP C 15PF J	K2,M2
C104			CC73FCH1H180J	CHIP C 18PF J	KMTE
C105			CC73FCH1H220J	CHIP C 22PF J	K2,M2
C105			CC73FCH1H390J	CHIP C 39PF J	KMTE
C106			CK73GB1H102K	CHIP C 1000PF K	
C107			CK73GB1H103K	CHIP C 0.010UF K	
C108			CC73FCH1H150J	CHIP C 15PF J	KMTE
C108			CC73FCH1H180J	CHIP C 18PF J	K2,M2
C109			CK73GB1H102K	CHIP C 1000PF K	
C110			CC73FCH1H220J	CHIP C 22PF J	K2,M2
C110			CC73FCH1H270J	CHIP C 27PF J	KMTE
C111			C92-0502-05	CHIP-TAN 0.33UF 35WV	
C112			CK73GB1H102K	CHIP C 1000PF K	
C113			CC73FCH1H070D	CHIP C 7.0PF D	K2,M2
C113			CC73FCH1H150J	CHIP C 15PF J	KMTE
C114			CC73FCH1H030C	CHIP C 3.0PF C	KMTE
C114			CC73FCH1H120J	CHIP C 12PF J	K2,M2
C115			CK73GB1H102K	CHIP C 1000PF K	KMK2M2
C115			CK73GB1H103K	CHIP C 0.010UF K	T,E
C116			CK73GB1H102K	CHIP C 1000PF K	
C117			CK73GB1H103K	CHIP C 0.010UF K	
C118			CC73GCH1H270J	CHIP C 27PF J	
C119,120			CK73GB1H102K	CHIP C 1000PF K	
C121			CC73GCH1H030C	CHIP C 3.0PF C	K2,M2
C122			CC73FCH1H180J	CHIP C 18PF J	
C123			CK73FB1H102K	CHIP C 1000PF K	
C124			CC73GCH1H180J	CHIP C 18PF J	
C125			CK73GB1H102K	CHIP C 1000PF K	
C126			CC73GCH1H080D	CHIP C 8.0PF D	KMK2M2
C126			CC73GCH1H100D	CHIP C 10PF D	T,E
C128			CC73GCH1H020C	CHIP C 2.0PF C	K2,M2
C130			CC73GCH1H020C	CHIP C 2.0PF C	K2,M2
C131			CC73GCH1H220J	CHIP C 22PF J	
C132			CK73GB1H103K	CHIP C 0.010UF K	
C133			CC73GCH1H220J	CHIP C 22PF J	
C134			CK73GB1H102K	CHIP C 1000PF K	
C136-138			CK73GB1H103K	CHIP C 0.010UF K	
C139			CC73GCH1H020C	CHIP C 2.0PF C	E
C139			CC73GCH1H070D	CHIP C 7.0PF D	T
C140			CC73GCH1H120J	CHIP C 12PF J	T
C141			CC73GCH1H020C	CHIP C 2.0PF C	E
C141			CC73GCH1H070D	CHIP C 7.0PF D	T
C142			CK73GB1C104K	CHIP C 0.10UF K	
C201			CK73GB1H102K	CHIP C 1000PF K	
C202			CC73GCH1H101J	CHIP C 100PF J	
C203,204			CK73GB1H102K	CHIP C 1000PF K	
C205			CC73GCH1H101J	CHIP C 100PF J	
C206,207			CK73GB1H102K	CHIP C 1000PF K	

PARTS LIST

TX-RX UNIT (X57-444X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
C209			CK73GB1H102K	CHIP C 1000PF K	
C210-216			CC73GCH1H101J	CHIP C 100PF J	
C217			CK73GB1H102K	CHIP C 1000PF K	
C218			CK73GB1H103K	CHIP C 0.010UF K	
C219,220			CK73GB1H102K	CHIP C 1000PF K	
C221			CK73GB1H472K	CHIP C 4700PF K	
C222			CK73GB1H103K	CHIP C 0.010UF K	
C223,224			C92-0519-05	CHIP-TAN 1.0UF 25WV	
C225			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C226			CK73GB1H103K	CHIP C 0.010UF K	
C227			CK73GB1H102K	CHIP C 1000PF K	
C228,229			CK73GB1H103K	CHIP C 0.010UF K	
C231			CK73GB1H103K	CHIP C 0.010UF K	
C233			CK73GB1E223K	CHIP C 0.022UF K	
C234			CK73GB1H103K	CHIP C 0.010UF K	
C235			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C236			CK73GB1H682K	CHIP C 6800PF K	
C237			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C238			C92-0536-05	CHIP-TAN 10UF 10WV	
C239			CK73GB1E223K	CHIP C 0.022UF K	
C240			CC73GCH1H470J	CHIP C 47PF J	
C241			CK73GB1H103K	CHIP C 0.010UF K	
C242			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C243-245			CK73GB1H103K	CHIP C 0.010UF K	
C246			CK73GB1H102K	CHIP C 1000PF K	
C247			CK73GB1H103K	CHIP C 0.010UF K	E
C247,248			CK73GB1H103K	CHIP C 0.010UF K	K,M,T
C247,248			CK73GB1H103K	CHIP C 0.010UF K	K2,M2
C248			CK73GB1C473K	CHIP C 0.047UF K	E
C249			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C251			CC73GCH1H270J	CHIP C 27PF J	
C252			CK73GB1H103K	CHIP C 0.010UF K	
C253			CC73GCH1H100D	CHIP C 10PF D	
C254			CK73GB1E223K	CHIP C 0.022UF K	
C255			CK73GB1H103K	CHIP C 0.010UF K	
C256			CK73GB1C273K	CHIP C 0.027UF K	
C257			CK73EB1H103K	CHIP C 0.010UF K	K,M,T
C257			CK73EB1H103K	CHIP C 0.010UF K	K2,M2
C257			CK73FB1A105K	CHIP C 1.0UF K	E
C258			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C259			CK73GB1H561K	CHIP C 560PF K	
C260			CK73GB1C393K	CHIP C 0.039UF K	
C261			CK73GB1H102K	CHIP C 1000PF K	
C262			CK73GB1H103K	CHIP C 0.010UF K	
C263			CK73GB1H332K	CHIP C 3300PF K	
C264			CK73GB1H103K	CHIP C 0.010UF K	
C265			C92-0519-05	CHIP-TAN 1.0UF 25WV	
C266			CK73GB1H122K	CHIP C 1200PF K	
C267			CK73GB1H102K	CHIP C 1000PF K	
C268			CC73FCH1H751J	CHIP C 750PF J	
C269			CK73HB1E102K	CHIP C 1000PF K	
C270			CK73GB1C104K	CHIP C 0.10UF K	
C271,272			CK73GB1H103K	CHIP C 0.010UF K	
C273			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C274			CC73GCH1H101J	CHIP C 100PF J	
C275			CC73GCH1H181J	CHIP C 180PF J	
C276			CK73GB1H332K	CHIP C 3300PF K	
C277			CK73HB1C103K	CHIP C 0.010UF K	

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
C278-280			CK73HB1E221K	CHIP C 220PF K	
C281			CC73HCH1E101J	CHIP C 100PF J	
C282-291			CK73HB1E221K	CHIP C 220PF K	
C292			CC73GCH1H221J	CHIP C 220PF J	
C293,294			CK73HB1E221K	CHIP C 220PF K	
C300,301			CK73HB1E221K	CHIP C 220PF K	
C302			CK73GB1H103K	CHIP C 0.010UF K	
C303			CK73FF1C334Z	CHIP C 0.33UF Z	
C304-311			CK73HB1E221K	CHIP C 220PF K	
C312			CC73GCH1H221J	CHIP C 220PF J	
C313-315			CK73HB1E221K	CHIP C 220PF K	
C316,317			CK73HB1E221K	CHIP C 220PF K	K,M,T
C316,317			CK73HB1E221K	CHIP C 220PF K	K2,M2
C316,317			CK73HB1E471K	CHIP C 470PF K	E
C318,319			CK73HB1E221K	CHIP C 220PF K	
C323			C92-0519-05	CHIP-TAN 1.0UF 25WV	
C324-326			CK73HB1E221K	CHIP C 220PF K	
C327			C92-0519-05	CHIP-TAN 1.0UF 25WV	
C328			CC73GCH1H101J	CHIP C 100PF J	
C329			C92-0514-05	CHIP-TAN 2.2UF 10WV	
C330,331			CK73HB1C103K	CHIP C 0.010UF K	
C332			CK73GB1C473K	CHIP C 0.047UF K	
C333			CK73GB1H102K	CHIP C 1000PF K	
C334			C92-0002-05	CHIP-TAN 0.22UF 35WV	
C335			CC73HCH1E680J	CHIP C 68PF J	
C337,338			CC73HCH1E330J	CHIP C 33PF J	
C339			CK73GB1H472K	CHIP C 4700PF K	
C340			C92-0546-05	CHIP-TAN 68UF 6.3WV	
C342			CK73GB1H103K	CHIP C 0.010UF K	
C343			CK73GB1H102K	CHIP C 1000PF K	
C344			CC73GCH1H101J	CHIP C 100PF J	
C345			CK73GB1H102K	CHIP C 1000PF K	
C346			CK73GB1H221K	CHIP C 220PF K	K,M,T
C346			CK73GB1H221K	CHIP C 220PF K	K2,M2
C347-350			CK73GB1H102K	CHIP C 1000PF K	
C351			CK73GB1H221K	CHIP C 220PF K	K,M,T
C351			CK73GB1H221K	CHIP C 220PF K	K2,M2
C352			CK73GB1C104K	CHIP C 0.10UF K	
C353			C92-0012-05	CHIP-TAN 22UF 6.3WV	K,M,T
C353			C92-0012-05	CHIP-TAN 22UF 6.3WV	K2,M2
C354			C92-0543-05	CHIP-TAN 3.3UF 10WV	
C355			CK73HB1E472K	CHIP C 4700PF K	
C356			CK73FB1C104KTD	CHIP C 0.10UF K	K,M,T
C356			CK73FB1C104KTD	CHIP C 0.10UF K	K2,M2
C357			CK73GB1C104K	CHIP C 0.10UF K	E
C358			CC73GCH1H100D	CHIP C 10PF D	E
C359			CK73FB1A105K	CHIP C 1.0UF K	E
C360			CK73FB1E104K	CHIP C 0.10UF K	E
C361			CK73GB1C104K	CHIP C 0.10UF K	E
C363			C92-0566-05	CHIP-TAN 10UF 6.3WV	E
C451			CK73GB1H103K	CHIP C 0.010UF K	
C452-454			CC73GCH1H101J	CHIP C 100PF J	
C455			CK73GB1H103K	CHIP C 0.010UF K	
C456			CK73GB1E223K	CHIP C 0.022UF K	
111	3A		E29-1125-04	INTER CONNECTOR	
CN1			E40-5717-05	FLAT CABLE CONNECTOR	
CN201			E40-5719-05	FLAT CABLE CONNECTOR	
CN202			E40-5660-05	FLAT CABLE CONNECTOR	

PARTS LIST

TX-RX UNIT (X57-444X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
CN203			E40-5661-05	PIN CONNECTOR	
CN204			E40-5657-05	FLAT CABLE CONNECTOR	
CN205			E40-5614-05	FLAT CABLE CONNECTOR	
CN206			E40-5662-05	PIN CONNECTOR	
CN451			E40-5718-05	FLAT CABLE CONNECTOR	
J1			E03-0170-05	DC JACK	
J201			E11-0457-05	PHONE JACK	
-			F10-2131-04	SHIELDING CASE	
F1			F53-0104-05	FUSE 4A/125V	
116	3A		J21-4458-14	HARDWARE FIXTURE LCD	
CD1			L79-1065-05	TUNING COIL	
CF1 ,2			L72-0906-05	CERAMIC FILTER 455kHz	KMK2M2
CF1 ,2		*	L72-0922-05	CERAMIC FILTER 455kHz	T
CF1 ,2		*	L72-0927-05	CERAMIC FILTER 455kHz	E
L1			L40-1001-37	SMALL FIXED INDUCTOR 10UH	
L2			L40-1095-34	SMALL FIXED INDUCTOR 1.0UH	
L3			L40-1081-37	SMALL FIXED INDUCTOR 0.10UH	
L4			L40-2781-37	SMALL FIXED INDUCTOR 0.27UH	KMK2M2
L4		*	L40-6881-37	SMALL FIXED INDUCTOR 0.68UH	T
L4 ,5			L40-3981-37	SMALL FIXED INDUCTOR 0.39UH	E
L5			L40-2781-37	SMALL FIXED INDUCTOR 0.27UH	T
L5			L40-5681-37	SMALL FIXED INDUCTOR 0.56UH	KMK2M2
L6			L40-1081-37	SMALL FIXED INDUCTOR 0.10UH	KMTE
L6 -8			L40-1281-37	SMALL FIXED INDUCTOR 0.12UH	K2,M2
L7			L40-1281-37	SMALL FIXED INDUCTOR 0.12UH	KMTE
L8			L40-1081-37	SMALL FIXED INDUCTOR 0.10UH	KMTE
L9 ,10			L34-4336-05	COIL 150MHz	
L11			L33-0763-05	SMALL FIXED INDUCTOR 21.6nH	
L12			L34-4336-05	COIL 150MHz	
L13 ,14			L33-0763-05	SMALL FIXED INDUCTOR 21.6nH	
L15			L40-1005-34	SMALL FIXED INDUCTOR 10UH	KMTE
L15			L40-2205-34	SMALL FIXED INDUCTOR 22UH	K2,M2
L16			L33-0765-05	SMALL FIXED INDUCTOR 49.8nH	
L17			L34-4335-05	COIL 150MHz	
L18			L40-1095-48	SMALL FIXED INDUCTOR 1.0UH	
L19			L40-4772-37	SMALL FIXED INDUCTOR 47nH	
L20			L92-0136-05	FERRITE TIP	
L21			L92-0137-05	FERRITE TIP	
L24			L40-4772-37	SMALL FIXED INDUCTOR 47nH	
L201			L40-1005-48	SMALL FIXED INDUCTOR 10UH	K,M,E
L201			L40-1015-48	SMALL FIXED INDUCTOR 100UH	K2M2T
L202			L40-1005-34	SMALL FIXED INDUCTOR 10UH	E
X1			L77-1563-15	VCXO 12.8MHz	T,E
X1			L77-1583-15	TCXO 12.8MHz	KMK2M2
X2			L77-1438-15	CRYSTAL RESONATOR 45.505MHz	
X201			L78-0332-15	RESONATOR 3.58MHz	
X202			L78-0331-05	RESONATOR 12MHz	
X451			L78-0336-05	RESONATOR 4.19MHz	
XF1			L71-0409-15	CRYSTAL FILTER 45.050MHz	K,M,E
XF1			L71-0409-15	CRYSTAL FILTER 45.050MHz	K2,M2
XF1		*	L71-0461-05	CRYSTAL FILTER 45.050MHz	T
R1			RK73GB1J224J	CHIP R 220K J 1/16W	
R2			RK73GB1J224J	CHIP R 220K J 1/16W	KMK2M2
R2			RK73GB1J244J	CHIP R 240K J 1/16W	T,E
R3			RK73GB1J330J	CHIP R 33 J 1/16W	
R4			RK73GB1J104J	CHIP R 100K J 1/16W	

Ref. No.	Address	New parts	Parts No.	Description	Destination
R6			RK73GB1J473J	CHIP R 47K J 1/16W	
R7			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R8 ,9			RK73GB1J472J	CHIP R 4.7K J 1/16W	
R10			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R11			RK73GB1J103J	CHIP R 10K J 1/16W	KMK2M2
R11			RK73GB1J223J	CHIP R 22K J 1/16W	T,E
R12			RK73GB1J473J	CHIP R 47K J 1/16W	
R14			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R16			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R17			RK73GB1J821J	CHIP R 820 J 1/16W	
R18			RK73GB1J220J	CHIP R 22 J 1/16W	
R19			RK73GB1J681J	CHIP R 680 J 1/16W	
R20			RK73GB1J221J	CHIP R 220 J 1/16W	
R21			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R22			RK73HB1J221J	CHIP R 220 J 1/16W	
R24			RK73GB1J470J	CHIP R 47 J 1/16W	
R25			RK73GB1J330J	CHIP R 33 J 1/16W	
R26			RK73GB1J272J	CHIP R 2.7K J 1/16W	
R27			RK73GB1J101J	CHIP R 100 J 1/16W	
R28			RK73GB1J104J	CHIP R 100K J 1/16W	T,E
R28			RK73GB1J124J	CHIP R 120K J 1/16W	KMTE
R29			RK73GB1J104J	CHIP R 100K J 1/16W	
R30			RK73GB1J154J	CHIP R 150K J 1/16W	T,E
R30			RK73GB1J684J	CHIP R 680K J 1/16W	KMK2M2
R31			RK73GB1J184J	CHIP R 180K J 1/16W	K2,M2
R31			RK73GB1J224J	CHIP R 220K J 1/16W	KMTE
R32			RK73GB1J271J	CHIP R 270 J 1/16W	T
R32			RK73GB1J681J	CHIP R 680 J 1/16W	K,M,E
R32			RK73GB1J681J	CHIP R 680 J 1/16W	K2,M2
R34			RK73GB1J333J	CHIP R 33K J 1/16W	
R35			RK73GB1J100J	CHIP R 10 J 1/16W	T
R35			RK73GB1J220J	CHIP R 22 J 1/16W	E
R35			RK73GB1J330J	CHIP R 33 J 1/16W	KMK2M2
042700					
R36			RK73GB1J181J	CHIP R 180 J 1/16W	T
R36			RK73GB1J331J	CHIP R 330 J 1/16W	K,M,E
R36			RK73GB1J331J	CHIP R 330 J 1/16W	K2,M2
R37			RK73GB1J101J	CHIP R 100 J 1/16W	KMK2M2
043100					
R37			RK73GB1J470J	CHIP R 47 J 1/16W	T,E
R38 -40			RK73GB1J332J	CHIP R 3.3K J 1/16W	
R41			RK73GB1J102J	CHIP R 1.0K J 1/16W	KMK2M2
R41			RK73GB1J561J	CHIP R 560 J 1/16W	T,E
R42			RK73GB1J100J	CHIP R 10 J 1/16W	
R43			RK73GB1J562J	CHIP R 5.6K J 1/16W	K2,M2
R43			RK73GB1J682J	CHIP R 6.8K J 1/16W	KMTE
R44			RK73GB1J332J	CHIP R 3.3K J 1/16W	
R45			RK73GB1J820J	CHIP R 82 J 1/16W	
R46			RK73GB1J473J	CHIP R 47K J 1/16W	
R47			RK73GB1J271J	CHIP R 270 J 1/16W	
R48			RK73GB1J180J	CHIP R 18 J 1/16W	
R49			RK73GB1J271J	CHIP R 270 J 1/16W	
R50 -52			RK73GB1J473J	CHIP R 47K J 1/16W	
R53			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R54			R92-1218-05	CHIP R 0.1 J 1/2W	
R55			RK73GB1J123J	CHIP R 12K J 1/16W	
R56			RK73GB1J104J	CHIP R 100K J 1/16W	
R57			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R58			RK73GB1J154J	CHIP R 150K J 1/16W	

PARTS LIST

TX-RX UNIT (X57-444X-XX)

Ref. No.	Address	New parts	Parts No.	Description			Desti- nation
R59			RK73GB1J473J	CHIP R	47K	J 1/16W	
R60 ,61			RK73GB1J104J	CHIP R	100K	J 1/16W	
R62			RK73GB1J224J	CHIP R	220K	J 1/16W	
R63			RK73GB1J100J	CHIP R	10	J 1/16W	T,E
R63			RK73GB1J470J	CHIP R	47	J 1/16W	KMK2M2
R64			RK73GB1J104J	CHIP R	100K	J 1/16W	
R65			RK73GB1J151J	CHIP R	150	J 1/16W	K,M
R65			RK73GB1J181J	CHIP R	180	J 1/16W	K2M2TE
R66			RK73GB1J473J	CHIP R	47K	J 1/16W	
R67			RK73FB2A181J	CHIP R	180	J 1/10W	
R69			RK73GB1J220J	CHIP R	22	J 1/16W	
R70			RK73GB1J330J	CHIP R	33	J 1/16W	
R71			RK73FB2A181J	CHIP R	180	J 1/10W	
R72			RK73GB1J330J	CHIP R	33	J 1/16W	
R73			RK73GB1J470J	CHIP R	47	J 1/16W	
R74			RK73GB1J100J	CHIP R	10	J 1/16W	
R75 -77			RK73GB1J102J	CHIP R	1.0K	J 1/16W	T,E
R78			R92-1252-05	CHIP R	0 OHM		
R201			RK73GB1J101J	CHIP R	100	J 1/16W	
R202-210			RK73GB1J102J	CHIP R	1.0K	J 1/16W	
R211			RK73GB1J471J	CHIP R	470	J 1/16W	
R212,213			RK73GB1J223J	CHIP R	22K	J 1/16W	
R215			RK73GB1J102J	CHIP R	1.0K	J 1/16W	
R216			RK73GB1J183J	CHIP R	18K	J 1/16W	
R218			RK73GB1J103J	CHIP R	10K	J 1/16W	
R219			RK73GB1J102J	CHIP R	1.0K	J 1/16W	
R220			RK73GB1J124J	CHIP R	120K	J 1/16W	
R221			RK73GB1J104J	CHIP R	100K	J 1/16W	
R222			RK73GB1J224J	CHIP R	220K	J 1/16W	
R223			RK73GB1J104J	CHIP R	100K	J 1/16W	
R224			RK73GB1J563J	CHIP R	56K	J 1/16W	
R225			RK73GB1J153J	CHIP R	15K	J 1/16W	
R226			RK73GB1J123J	CHIP R	12K	J 1/16W	
R227			RK73GB1J103J	CHIP R	10K	J 1/16W	
R228			RK73GB1J124J	CHIP R	120K	J 1/16W	
R229			RK73GB1J473J	CHIP R	47K	J 1/16W	
R230			RK73GB1J473J	CHIP R	47K	J 1/16W	T
R230			RK73GB1J563J	CHIP R	56K	J 1/16W	E
R230			RK73GB1J683J	CHIP R	68K	J 1/16W	KMK2M2
R231			RK73GB1J224J	CHIP R	220K	J 1/16W	
R232			RK73GB1J154J	CHIP R	150K	J 1/16W	
R233			RK73GB1J273J	CHIP R	27K	J 1/16W	
R234			RK73GB1J563J	CHIP R	56K	J 1/16W	
R235			R92-0670-05	CHIP R	0 OHM		
R236			RK73GB1J222J	CHIP R	2.2K	J 1/16W	K,M,T
R236			RK73GB1J222J	CHIP R	2.2K	J 1/16W	K2,M2
R236			RK73GB1J471J	CHIP R	470	J 1/16W	E
R237			RK73GB1J223J	CHIP R	22K	J 1/16W	E
R237			RK73GB1J474J	CHIP R	470K	J 1/16W	K,M,T
R237			RK73GB1J474J	CHIP R	470K	J 1/16W	K2,M2
R239			RK73GB1J154J	CHIP R	150K	J 1/16W	
R240			RK73GB1J104J	CHIP R	100K	J 1/16W	
R241			RK73GB1J152J	CHIP R	1.5K	J 1/16W	
R242			RK73GB1J104J	CHIP R	100K	J 1/16W	
R243			RK73GB1J223J	CHIP R	22K	J 1/16W	
R244			RK73GB1J824J	CHIP R	820K	J 1/16W	
R245			RK73GB1J684J	CHIP R	680K	J 1/16W	
R246			RK73GB1J223J	CHIP R	22K	J 1/16W	

Ref. No.	Address	New parts	Parts No.	Description			Desti- nation
R247			RK73GB1J824J	CHIP R	820K	J 1/16W	
R248			RK73GB1J153J	CHIP R	15K	J 1/16W	
R249			RK73GB1J822J	CHIP R	8.2K	J 1/16W	
R250			RK73GB1J104J	CHIP R	100K	J 1/16W	E
R250			RK73GB1J273J	CHIP R	27K	J 1/16W	K,M,T
R250			RK73GB1J273J	CHIP R	27K	J 1/16W	K2,M2
R251			RK73GB1J473J	CHIP R	47K	J 1/16W	
R252			RK73GB1J683J	CHIP R	68K	J 1/16W	E
R252,253			RK73GB1J103J	CHIP R	10K	J 1/16W	K,M,T
R252,253			RK73GB1J103J	CHIP R	10K	J 1/16W	K2,M2
R253			RK73GB1J104J	CHIP R	100K	J 1/16W	E
R254-256			RK73GB1J104J	CHIP R	100K	J 1/16W	
R257			RK73GB1J154J	CHIP R	150K	J 1/16W	
R258			RK73GB1J104J	CHIP R	100K	J 1/16W	
R259			RK73HB1J473J	CHIP R	47K	J 1/16W	
R260			RK73GB1J104J	CHIP R	100K	J 1/16W	
R261			R92-1252-05	CHIP R	0 OHM		
R263			RK73GB1J683J	CHIP R	68K	J 1/16W E	
R263			RK73GB1J823J	CHIP R	82K	J 1/16W	K,M,T
R263			RK73GB1J823J	CHIP R	82K	J 1/16W	K2,M2
R264			RK73GB1J104J	CHIP R	100K	J 1/16W	
R265			RK73GB1J223J	CHIP R	22K	J 1/16W	
R266			RK73GB1J473J	CHIP R	47K	J 1/16W	T,E
R266			RK73GB1J683J	CHIP R	68K	J 1/16W	KMK2M2
053300							
R267			RK73GB1J101J	CHIP R	100	J 1/16W	
R268			RK73GB1J823J	CHIP R	82K	J 1/16W	
R269			RK73GB1J330J	CHIP R	33	J 1/16W	
R270			RK73GB1J103J	CHIP R	10K	J 1/16W	
R271			RK73GB1J330J	CHIP R	33	J 1/16W	
R272			RK73HB1J473J	CHIP R	47K	J 1/16W	
R273			RK73GB1J103J	CHIP R	10K	J 1/16W	
R274			RK73GB1J101J	CHIP R	100	J 1/16W	
R275			RK73GB1J474J	CHIP R	470K	J 1/16W	
R276,277			RK73GB1J103J	CHIP R	10K	J 1/16W	
R278			RK73GB1J102J	CHIP R	1.0K	J 1/16W	
R279			RK73GB1J683J	CHIP R	68K	J 1/16W	
R280			R92-1252-05	CHIP R	0 OHM		
R281			RK73GB1J683J	CHIP R	68K	J 1/16W	
R282			RK73HB1J330J	CHIP R	33	J 1/16W	
R283			RK73HB1J473J	CHIP R	47K	J 1/16W	
R284-292			RK73HB1J101J	CHIP R	100	J 1/16W	
R293			R92-1368-05	CHIP R	0 OHM		
R294-296			RK73HB1J101J	CHIP R	100	J 1/16W	K,M,T
R294-296			RK73HB1J101J	CHIP R	100	J 1/16W	K2,M2
R294-296			RK73HB1J472J	CHIP R	4.7K	J 1/16W	E
R297			RK73GB1J473J	CHIP R	47K	J 1/16W	
R298			R92-1368-05	CHIP R	0 OHM		
R299-302			RK73HB1J101J	CHIP R	100	J 1/16W	K,M,T
R299-302			RK73HB1J101J	CHIP R	100	J 1/16W	K2,M2
R299-302			RK73HB1J472J	CHIP R	4.7K	J 1/16W	E
R303			RK73GB1J473J	CHIP R	47K	J 1/16W	
R304			RK73HB1J472J	CHIP R	4.7K	J 1/16W	E
R304-309			RK73HB1J101J	CHIP R	100	J 1/16W	K,M,T
R304-309			RK73HB1J101J	CHIP R	100	J 1/16W	K2,M2
R305-309			RK73HB1J101J	CHIP R	100	J 1/16W	E
R310			RK73HB1J473J	CHIP R	47K	J 1/16W	
R311			RK73GB1J473J	CHIP R	47K	J 1/16W	
R312			RK73GB1J104J	CHIP R	100K	J 1/16W	

PARTS LIST

TX-RX UNIT (X57-444X-XX)

Ref. No.	Address	New parts	Parts No.	Description	Destination
R313-315			RK73HB1J101J	CHIP R 100 J 1/16W	
R316			RK73GB1J101J	CHIP R 100 J 1/16W	
R317			RK73GB1J473J	CHIP R 47K J 1/16W	
R318			RK73HB1J104J	CHIP R 100K J 1/16W	
R319			RK73GB1J222J	CHIP R 2.2K J 1/16W	
R320-323			RK73HB1J473J	CHIP R 47K J 1/16W	
R324			RK73GB1J100J	CHIP R 10 J 1/16W	
R325			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R326,327			RK73HB1J473J	CHIP R 47K J 1/16W	
R328			RK73GB1J223J	CHIP R 22K J 1/16W	
R329			RK73HB1J473J	CHIP R 47K J 1/16W	
R330			RK73HB1J104J	CHIP R 100K J 1/16W	
R331			RK73GB1J474J	CHIP R 470K J 1/16W	
R332			R92-1252-05	CHIP R 0 OHM	
R334			RK73GB1J333J	CHIP R 33K J 1/16W	
R335			RK73GB1J393J	CHIP R 39K J 1/16W	
R336			RK73GB1J103J	CHIP R 10K J 1/16W	
R337,338			RK73GB1J473J	CHIP R 47K J 1/16W	
R340			RK73GB1J473J	CHIP R 47K J 1/16W	
R341			R92-1368-05	CHIP R 0 OHM	
R342			RK73GB1J103J	CHIP R 10K J 1/16W	
R343			R92-1368-05	CHIP R 0 OHM	
R344			RK73GB1J473J	CHIP R 47K J 1/16W	
R346			RK73GB1J101J	CHIP R 100 J 1/16W	
R347			RK73EB2ER39K	CHIP R 0.39 K 1/4W	
R348			RK73GB1J103J	CHIP R 10K J 1/16W	
R349-351			RK73GB1J104J	CHIP R 100K J 1/16W	
R353			RK73GB1J153J	CHIP R 15K J 1/16W	
R354			RK73GB1J153J	CHIP R 15K J 1/16W	E
R354			RK73GB1J203J	CHIP R 20K J 1/16W	K,M,T
R354			RK73GB1J203J	CHIP R 20K J 1/16W	K2,M2
R356			RK73HB1J103J	CHIP R 10K J 1/16W	
R357			RK73GB1J103J	CHIP R 10K J 1/16W	
R358			RK73GB1J104J	CHIP R 100K J 1/16W	
R359			RK73GB1J472J	CHIP R 4.7K J 1/16W	K,M,T
R359			RK73GB1J472J	CHIP R 4.7K J 1/16W	K2,M2
R360			R92-0670-05	CHIP R 0 OHM E	
R361			RK73GB1J472J	CHIP R 4.7K J 1/16W E	
R362			RK73GB1J273J	CHIP R 27K J 1/16W E	
R363			RK73GB1J824J	CHIP R 820K J 1/16W E	
R364			RK73GB1J223J	CHIP R 22K J 1/16W E	
R365			RK73GB1J473J	CHIP R 47K J 1/16W E	
R366			R92-1368-05	CHIP R 0 OHM E	
R452			RK73GB1J100J	CHIP R 10 J 1/16W	
R455			RK73GB1J271J	CHIP R 270 J 1/16W	
R457			RK73GB1J471J	CHIP R 470 J 1/16W	
R459			RK73GB1J100J	CHIP R 10 J 1/16W	
R462-466			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R467			RK73GB1J561J	CHIP R 560 J 1/16W	
R468-471			RK73GB1J102J	CHIP R 1.0K J 1/16W	
R472			RK73GB1J103J	CHIP R 10K J 1/16W	
MIC201			T91-0547-05	MICROPHONE ELEMENT	
D1			D1F20	DIODE	
D2 ,3			1SS368	DIODE	
D4 -7			HVU350	VARI-CAP DIODE	
D8			MI809	DIODE	
D9			1SS312	DIODE	

Ref. No.	Address	New parts	Parts No.	Description	Destination
D10			HSM88AS	DIODE	
D202-204			DA221	DIODE	E
D202,203			DA221	DIODE	K,M,T
D202,203			DA221	DIODE	K2,M2
IC1			NJU7201U50	IC(VOLTAGE REGULATOR)	
IC2			MC3372V	IC(FM IF)	
IC3			MB1512PFV-GBND	IC(PLL FREQUENCY SYNTHESIZER)	
IC4			NJM1458M	IC(OP AMP X2)	
IC5			M67755HA	IC(POWER MODULE/150-174MHz6W))	KMTE
IC5			M67755LA	IC(POWER MODULE/135-174MHz6W))	K2,M2
IC201			TA75W01FU	IC(OP AMP X2)	
IC202			TC7S66FU	IC(ANALOG SWITCH)	
IC203,204			NJU7201U50	IC(VOLTAGE REGULATOR)	
IC205			TA75W01FU	IC(OP AMP X2)	
IC206			M62363FP	IC(8bit D/A CONVERTER)	
IC207		*	TC75W51FU	IC(OP AMP X2)	E
IC207			TA75W558FU	IC(OP AMP X2)	K,M,T
IC207			TA75W558FU	IC(OP AMP X2)	K2,M2
IC208			MC33172D	IC(OP AMP X2)	
IC209			TC74VHC573FS	IC(8bit D TYPE LATCH)	
IC210,211			TA75W01FU	IC(OP AMP X2)	
IC212			HN58C257T-20	IC(32768X8bit EEPROM)	
IC213			BU4094BCFV	IC(8bit SHIFT/STORE REGISTER)	
IC213			XRU4094BCFV	IC(8bit SHIFT/STORE REGISTER)	
IC214			TA75W01FU	IC(OP AMP X2)	
IC215			TC7S32FU	IC(2INPUT OR GATE)	
IC216			TA75W01FU	IC(OP AMP X2)	
IC217			TC7S04FU	IC(INVERTER)065200	
IC218			TC35305F	IC(DTMF RECEIVER)	
IC219			PCD3312CT	C(DTMF/MODEM/MUSICEL TONE)	
IC220			BR24C01AF	IC(128X8bit EEPROM)	
IC220			XL24C01AF	IC(128X8bit EEPROM)	
IC221			78312AGF3553BE	IC(16/8bit MICROPROCESSOR)	
IC222			TA7368F	IC(AF POWER AMP)	
IC223			TA75W01FU	IC(OP AMP X2)	K,M,T
IC223			TA75W01FU	IC(OP AMP X2)	K2,M2
IC223		*	TC75W51FU	IC(OP AMP X2)	E
IC451			75308BGK739BE9	IC(4bit MICROPROCESSOR)	
IC452			S-8054ALB-LM	IC(VOLTAGE DETECTOR)	
Q1			DTC144EE	DIGITAL TRANSISTOR	
Q2			DTA114EE	DIGITAL TRANSISTOR	
Q3			DTA123EE	DIGITAL TRANSISTOR	
Q4			2SJ243	FET	
Q5			2SC4617(S)	TRANSISTOR	
Q6			2SB1119(S)	TRANSISTOR	
Q7			2SC4617(S)	TRANSISTOR	
Q8			2SK208(O)	FET	
Q9			DTC143EE	DIGITAL TRANSISTOR	
Q10			2SC4215(Y)	TRANSISTORKMK2M2	
Q10			2SC5090	TRANSISTORT,E	
Q11			2SA1832(GR)	TRANSISTOR	
Q12			2SC5090	TRANSISTOR	
Q13			2SC5066(O)	TRANSISTOR	
Q14			SGM2014M	FET	
Q15			2SC4226(R24)	TRANSISTOR	
Q16			2SB1119(S)	TRANSISTOR	
Q17			2SK1215(E)	FET	
Q18			DTA114YE	DIGITAL TRANSISTOR	K,M,T
Q18			DTA114YE	DIGITAL TRANSISTOR	K2,M2

PARTS LIST

TX-RX UNIT (X57-444X-XX)
VCO UNIT (X58-4130-10)
VCO UNIT (X58-4290-50)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
Q19			DTC144EE	DIGITAL TRANSISTOR	
Q20			2SC4617(S)	TRANSISTOR	
Q201			2SJ243	FET	
Q202			2SK1824	FET	
Q203			DTC144EE	DIGITAL TRANSISTOR	
Q204			2SA1586(Y,GR)	TRANSISTOR	
Q205-207			DTC144EE	DIGITAL TRANSISTOR	
Q208			2SA1362(GR)	TRANSISTOR	
Q209			2SC4215(Y)	TRANSISTOR	
Q210			2SK1588	FET	
Q211			DTA144EE	DIGITAL TRANSISTOR	
Q212			2SK879(Y)	FET	E
TH1			TN103S472JT	THERMISTOR	
TH201			157-302-53008	THERMISTOR	
A1			X58-4130-10	SUB UNIT PLL	K,M
A1			X58-4130-11	SUB UNIT PLL	K2,M2
A1		*	X58-4290-50	SUB UNIT PLL	T,E

VCO UNIT (X58-4130-10)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
C501			CK73HB1E102K	CHIP C 1000PF K	
C504,505			CC73HCH1E050C	CHIP C 5.0PF C	K2,M2
C506			CC73HCH1E010C	CHIP C 1.0PF C	
C507			CC73HCH1E470J	CHIP C 47PF J	
C508			CC73HCH1E330J	CHIP C 33PF J	
C509,510			CC73HCH1E470J	CHIP C 47PF J	
C511			CC73HCH1E390J	CHIP C 39PF J	
C512			CC73HCH1E220J	CHIP C 22PF J	
C513			CK73HB1C103K	CHIP C 0.010UF K	
C514			CC73HCH1E020C	CHIP C 2.0PF C	K,M
071000					
C514			CC73HCH1E050C	CHIP C 5.0PF C	K2,M2
071100					
C515			CC73HCH1E050C	CHIP C 5.0PF C	
C516-518			CK73HB1E102K	CHIP C 1000PF K	
C521			CC73HCH1E100D	CHIP C 10PF D	
C522			CK73HB1E102K	CHIP C 1000PF K	
C523			C92-0513-05	CHIP-TAN 3.3UF 6.3WV	
C524			CK73HB1E102K	CHIP C 1000PF K	
C525			CK73HB1C103K	CHIP C 0.010UF K	
C527			CK73HB1C103K	CHIP C 0.010UF K	
TC501,502			C05-0380-15	TRIM CAP 10P	
CN501-506			E23-0983-05	PIN TERMINAL	
-			F10-2116-14	SHIELDING PLATE	
L501,502			L40-3391-37	SMALL FIXED INDUCTOR 3.3UH	
L503			L33-0750-05	SMALL FIXED INDUCTOR 17nH	K2,M2
072400					
L503			L33-1266-05	SMALL FIXED INDUCTOR 14.7nH	K,M
072500					
L504			L33-0750-05	SMALL FIXED INDUCTOR 17nH	
L505			L40-1081-37	SMALL FIXED INDUCTOR 0.10UH	K,M
072700					
L505			L40-1581-37	SMALL FIXED INDUCTOR 0.15UH	K2,M2
072800					
R503			RK73HB1J563J	CHIP R 56K J 1/16W	
R506			RK73HB1J274J	CHIP R 270K J 1/16W	
R507			RK73HB1J103J	CHIP R 10K J 1/16W	
R508			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R509			RK73HB1J822J	CHIP R 8.2K J 1/16W	

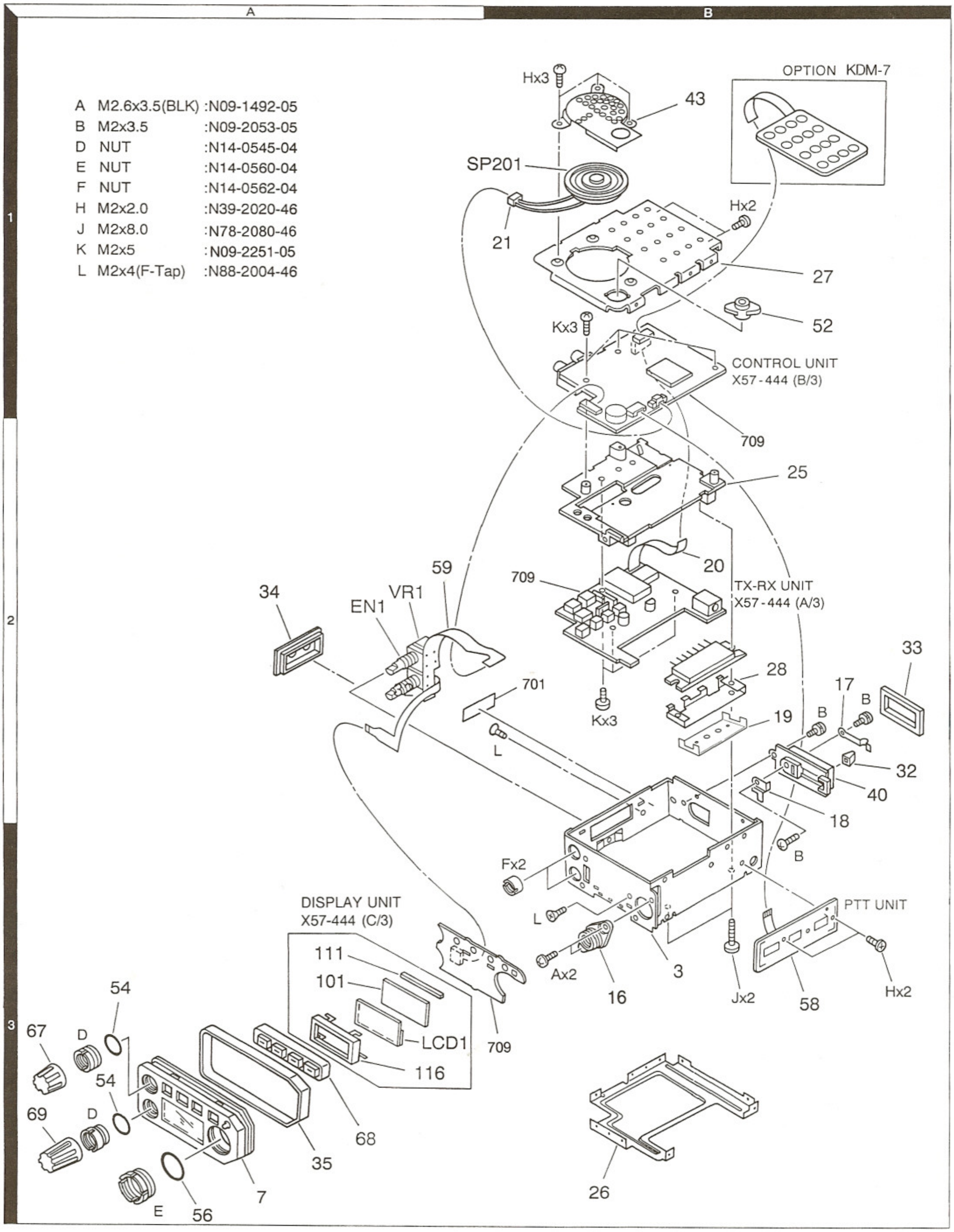
Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
R510			RK73HB1J332J	CHIP R 3.3K J 1/16W	
R511			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R512			RK73HB1J822J	CHIP R 8.2K J 1/16W	
R515,516			RK73HB1J271J	CHIP R 270 J 1/16W	K,M
R515,516			RK73HB1J331J	CHIP R 330 J 1/16W	K2,M2
D501			1SV228	VARI-CAP DIODE	
D502,503			1T363A	VARI-CAP DIODE	
D504			MA360	VARI-CAP DIODE	
Q501			UMG2	DIGITAL TRANSISTOR	
Q502			DTC144EE	DIGITAL TRANSISTOR	
Q503			2SC5090	TRANSISTOR	
Q504,505			2SC4226(R24)	TRANSISTOR	

VCO UNIT (X58-4290-50)

Ref. No.	Address	New parts	Parts No.	Description	Desti-nation
C501			CK73HB1C103K	CHIP C 0.010UF K	
C502			CC73HCH1E0R5C	CHIP C 0.5PF C	
C505			CC73HCH1E030C	CHIP C 3.0PF C	
C506			CC73HCH1E050C	CHIP C 5.0PF C	
C507			CC73HCH1E070D	CHIP C 7.0PF D	
C508			CC73HCH1E090D	CHIP C 9.0PF D	
C509,510			CC73HCH1E010C	CHIP C 1.0PF C	
511			CK73HB1E102K	CHIP C 1000PF K	
C512			CK73HB1C103K	CHIP C 0.010UF K	
C513			CK73HB1E102K	CHIP C 1000PF K	
C514			CK73HB1C103K	CHIP C 0.010UF K	
C515			CC73HCH1E150J	CHIP C 15PF J	
C516			CK73HB1E102K	CHIP C 1000PF K	
C517			CK73HB1C103K	CHIP C 0.010UF K	
C518			C92-0513-05	CHIP-TAN 3.3UF 6.3WV	
TC501,502			C05-0384-05	TRIM CAP 10P	
CN501-506			E23-0983-05	PIN TERMINAL	
-			F10-2116-14	SHIELDING PLATE	
L501			L40-3391-37	SMALL FIXED INDUCTOR 3.3UH	
L502			L40-2291-37	SMALL FIXED INDUCTOR 2.2UH	
L503		*	L33-1287-05	SMALL FIXED INDUCTOR 56nH	
L504			L33-0745-05	SMALL FIXED INDUCTOR 33nH	
L505			L40-6872-37	SMALL FIXED INDUCTOR 68nH	
R501			RK73HB1J473J	CHIP R 47K J 1/16W	
R502			RK73HB1J472J	CHIP R 4.7K J 1/16W	
R503			RK73HB1J274J	CHIP R 270K J 1/16W	
R504			RK73HB1J104J	CHIP R 100K J 1/16W	
R505,506			RK73HB1J391J	CHIP R 390 J 1/16W	
R507			RK73HB1J184J	CHIP R 180K J 1/16W	
R508			RK73HB1J470J	CHIP R 47 J 1/16W	
D501-504			HVU350	VARI-CAP DIODE	
D505			MA360	VARI-CAP DIODE	
Q501			UMC4	DIGITAL TRANSISTOR	
Q502			2SJ243	FET	
Q503,504			2SK508NV(K52)	FET	
Q505			2SC5066(O)	TRANSISTOR	

TK-250

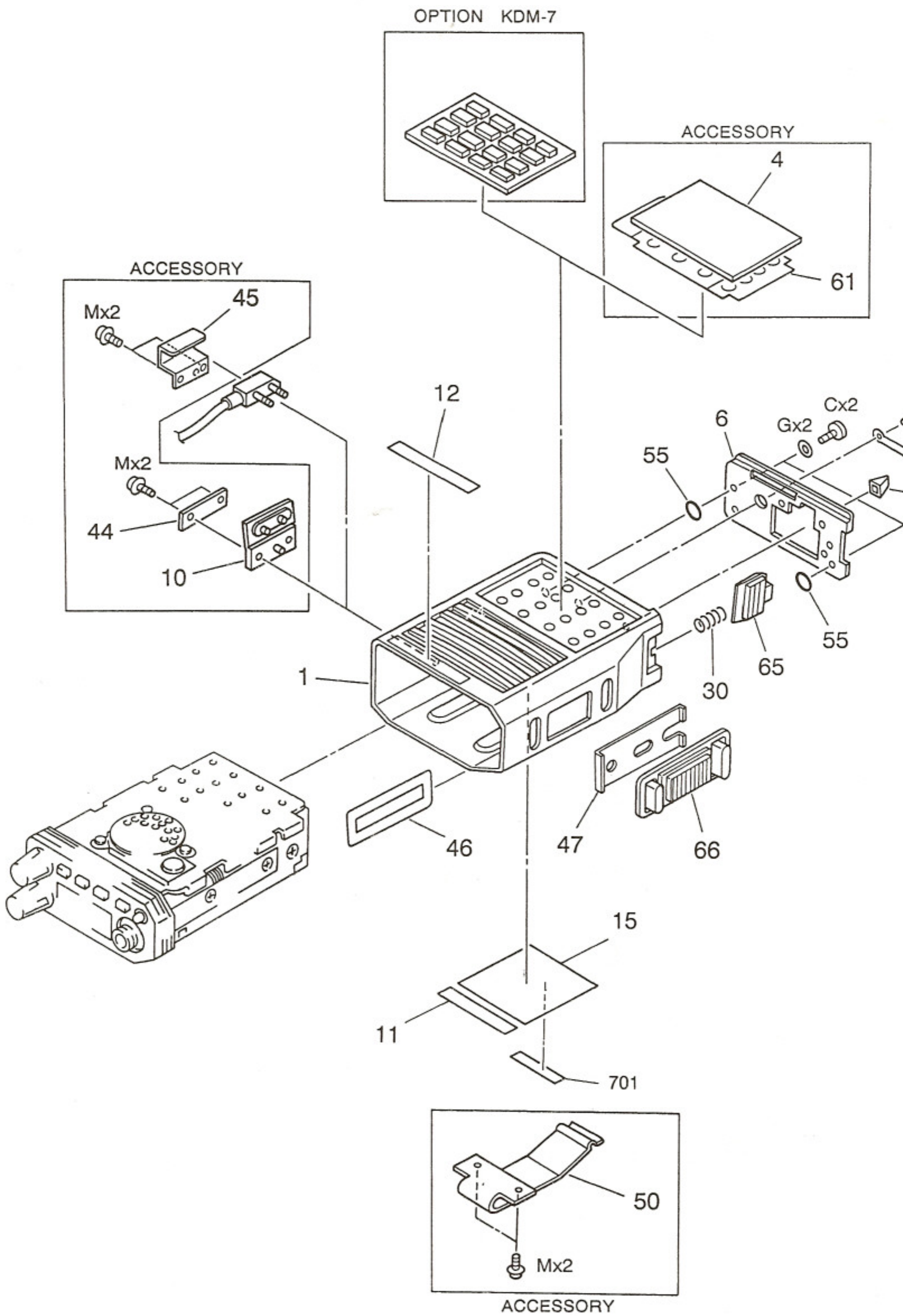
EXPLODED VIEW



Parts with the exploded numbers larger than 700 are not supplied.

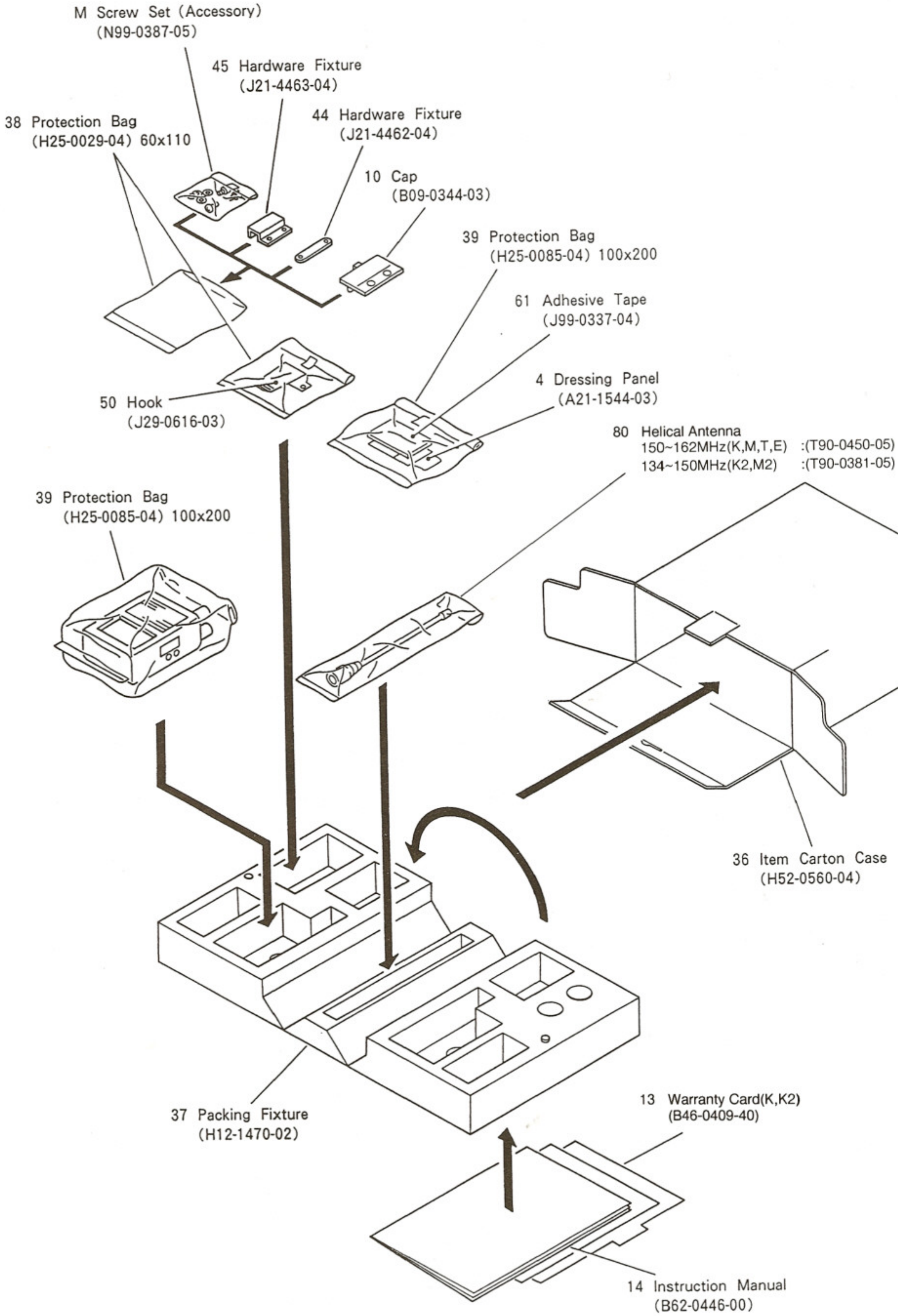
EXPLODED VIEW

B	M2x3.5	:N09-2053-05
C	M2.6x8	:N09-2185-05
G	WASHER	:N17-1026-60
M	SCREW SET	:N99-0387-05



Parts with the exploded numbers larger than 700 are not supplied.

PACKING


M Screw Set (Accessory)
(N99-0387-05)
45 Hardware Fixture
(J21-4463-04)
38 Protection Bag
(H25-0029-04) 60x110
44 Hardware Fixture
(J21-4462-04)
10 Cap
(B09-0344-03)
39 Protection Bag
(H25-0085-04) 100x200
61 Adhesive Tape
(J99-0337-04)
4 Dressing Panel
(A21-1544-03)
50 Hook
(J29-0616-03)
80 Helical Antenna
150~162MHz(K,M,T,E) :(T90-0450-05)
134~150MHz(K2,M2) :(T90-0381-05)
39 Protection Bag
(H25-0085-04) 100x200
36 Item Carton Case
(H52-0560-04)
37 Packing Fixture
(H12-1470-02)
13 Warranty Card(K,K2)
(B46-0409-40)
14 Instruction Manual
(B62-0446-00)

TERMINAL FUNCTION

TX-RX UNIT(X57-4440-10) (A/3) : TX-RX section

Connector No.	Pin No.	Pin Name	I/O	Function
CN1	1	E	-	GND
	2	DE	O	AF detection signal output (RX)
	3	MD	I	AF modulation signal input (TX)
	4	BL	I	AF modulation signal (Low Speed Data) input (TX)
	5	CK	I	PLL clock data input
	6	PE	I	PLL enable data input
	7	DT	I	PLL data line input
	8	KY	I	Normally : 5V, Transmit : 0V
	9	UL	O	Normally : 5V, Transmit : 0V
	10	SV	I	Normally : 0V, Transmit : 5V
	11	TR	I	Normally : 5V, Transmit : 0V
	12	PC	I	APC power control input (TX)
	13	SB	I	Power input after power switch
	14	PB	O	Power output after passing through the fuse
	15	B	O	Power output after passing through the fuse

TX-RX UNIT(X57-4440-10) (A/3) : TX-RX section

Connector No.	Pin No.	Pin Name	I/O	Function
J1	1	+B	I	External power supply input

TX-RX UNIT(X57-4440-10) (B/3) : Control section

Connector No.	Pin No.	Pin Name	I/O	Function
CN201	1	E	-	GND
	2	DE	I	AF detection signal input (RX)
	3	MD	O	AF modulation signal output (TX)
	4	BL	O	AF modulation signal (Low Speed Data) output (TX)
	5	CK	O	PLL clock data output
	6	PE	O	PLL enable data output
	7	DT	O	PLL data line output
	8	KY	O	Normally : 5V, Transmit : 0V
	9	UL	I	Normally : 5V, Transmit : 0V
	10	SV	O	Normally : 0V, Save mode : 5V
	11	TR	O	Normally : 5V, Transmit : 0V
	12	PC	O	APC power control input (TX)
	13	SB	O	Power output after power switch
	14	PB	I	Power input after passing through the fuse
	15	B	I	Power input after passing through the fuse

TX-RX UNIT(X57-4440-10) (B/3) : Control section

Connector No.	Pin No.	Pin Name	I/O	Function
CN202	1	MON	I	Normally : 5V, Monitor when connected GND.
	2	PTT	I	Normally : 5V, Transmit when connected GND.
	3	LMP	I	Normally : 5V, Lamp when connected GND.
	4	E	-	GND

TERMINAL FUNCTION

TX-RX UNIT(X57-4440-10) (B/3) : Control section

Connector No.	Pin No.	Pin Name	I/O	Function
CN203	1	TXAI	I	TX AF signal input
For Scrambler	2	RXAI	I	RX AF signal input
(SC-2450) etc.	3	SB	O	Power output after power switch
	4	E	-	GND
	5	T/R	O	Normally : 5V , Transmit : 0V
	6	EN2	O	Scrambler enable data input
	7	RXAO	O	RX AF signal output
	8	TXAO	O	TX AF signal output
	9	DT/DO	O	Binary code select 1 for scrambler
	10	CT/D1	O	Binary code select 2 for scrambler

TX-RX UNIT(X57-4440-10) (B/3) : Control section

Connector No.	Pin No.	Pin Name	I/O	Function
CN204	1	DKEY1	I	DTMF KEY
	2	DKEY2	I	DTMF KEY
	3	DKEY3	I	DTMF KEY
	4	DKEY4	I	DTMF KEY
	5	DKEY5	I	DTMF KEY
	6	DKEY6	I	DTMF KEY
	7	DKEY7	I	DTMF KEY
	8	DKEY8	I	DTMF KEY

TX-RX UNIT(X57-4440-10) (B/3) : Control section

Connector No.	Pin No.	Pin Name	I/O	Function
CN205	1	5M	O	5V
	2	TD	O	Serial control signal output
	3	RD	I	Serial control signal input
	4	RT	I	Reset signal input
	5	E	-	GND
	6	B	O	Power output after passing through the fuse
	7	SB	I	Power input after power switch
	8	AE	-	GND
	9	AI	I	AF signal input after volume
	10	A2	O	AF signal output for volume

TX-RX UNIT(X57-4440-10) (B/3) : Control section

Connector No.	Pin No.	Pin Name	I/O	Function
CN206	1	SP	O	Output for internal speaker
	2	E	-	GND

TERMINAL FUNCTION

TX-RX UNIT(X57-4440-10) (C/3) : Display section

Connector No.	Pin No.	Pin Name	I/O	Function
CN451	1	EC1	I	Encoder data input
	2	EC2	O	Encoder data input
	3	E	-	GND
	4	RST	O	Reset signal output
	5	RXD	O	Serial control signal output
	6	TXD	I	Serial control signal input
	7	5M	I	5V

VCO UNIT(X58-4130-10)

Connector No.	Pin No.	Pin Name	I/O	Function
CN501	1	MOD	I	AF modulation signal input (TX)
	2	T/R	I	Normally : 5V, Transmit : 0V
	3	LV	I	PLL lock voltage input (0~5V)

VCO UNIT(X58-4130-10)

Connector No.	Pin No.	Pin Name	I/O	Function
CN502	1	OUT	O	VCO output
	2	E	-	GND
	3	5V	I	5V

ADJUSTMENT

REQUIRED TEST EQUIPMENT

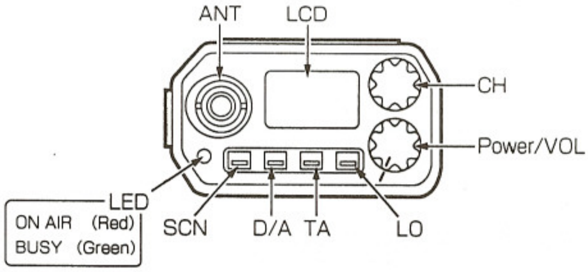
1. **Stabilized Power Supply**
   1) The supply voltage can be changed between 5V and 18V, and the current is 3A or more.
   2) The standard voltage is 7.5V.
2. **DC Ammeter**
   1) Class 1 ammeter (17 ranges and other features)
   2) The full scale can be set to either 300mA or 3A.
   3) A cable of less internal loss must be used.
3. **Frequency Counter (f. counter)**
   1) Frequencies of up to 1 GHZ or so can be measured.
   2) The sensitivity can be changed to 250MHz or below, and measurements are highly stable and accurate (0.2 ppm or so).
4. **Power Meter**
   1) Measurable frequency: Up to 520MHz
   2) Impedance: 50Ω, unbalanced
   3) Measuring range: Full scal of 10W or so
   4) A standard cable (5D2W 1m) must be used.
5. **RF VTVM (RF V.M)**
   1) Measurable frequency: Up to 520MHz or so
6. **Linear Detector**
   1) Measurable frequency: Up to 520MHz
   2) Characteristics are flat, and CN is 60dB or more.
7. **Digital Voltmeter**
   1) Voltage range: FS = 18V or so
   2) Input resistance: 1MΩ or more
8. **Oscilloscope**
   1) Measuring range: DC to 30MHz
   2) Provides highly accurate measurements for 5 to 25MHz.
9. **AF Voltmeter (AF VTVM)**
   1) Measurable frequency: 50Hz to 1MHz
   2) Maximum sensitivity: 1mV or more
10. **Spectrum Analyzer**
    1) Measuring range: DC to 1GHz or more
11. **Standard Signal Generator (SSG)**
    1) Maximum frequency: 520MHz or more
    2) Output: –20dB/0.1µV to 120dB/1V
    3) Output impedance: 50Ω
12. **Tracking Generator**
    1) Center frequency: 50kHz to 520MHz
    2) Frequency deviation: ±35MHz
    3) Output voltage: 100mV or more
13. **Dummy Load**
    1) 8Ω, 3W or more

- Use a non-conductive rod such as a Bakelite rod for adjustment (especially of trimmers and coils).
- To protect the SSG, do not send out signals while adjusting the receiving unit.
- The indicated SSG output levels are for maximum output.

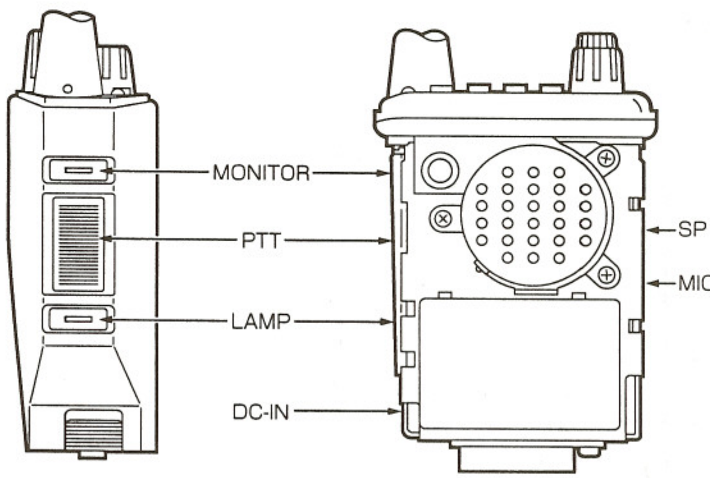
TK-250

Version	Frequency range	Remark
K,M, T, E (TYPE 1)	150~174MHz	IF1 45.05MHz LOC 45.505MHz
K2, M2 (TYPE 2)	136~150MHz	IF1 45.05MHz LOC 45.505MHz

Panel side view



Left and Right side view

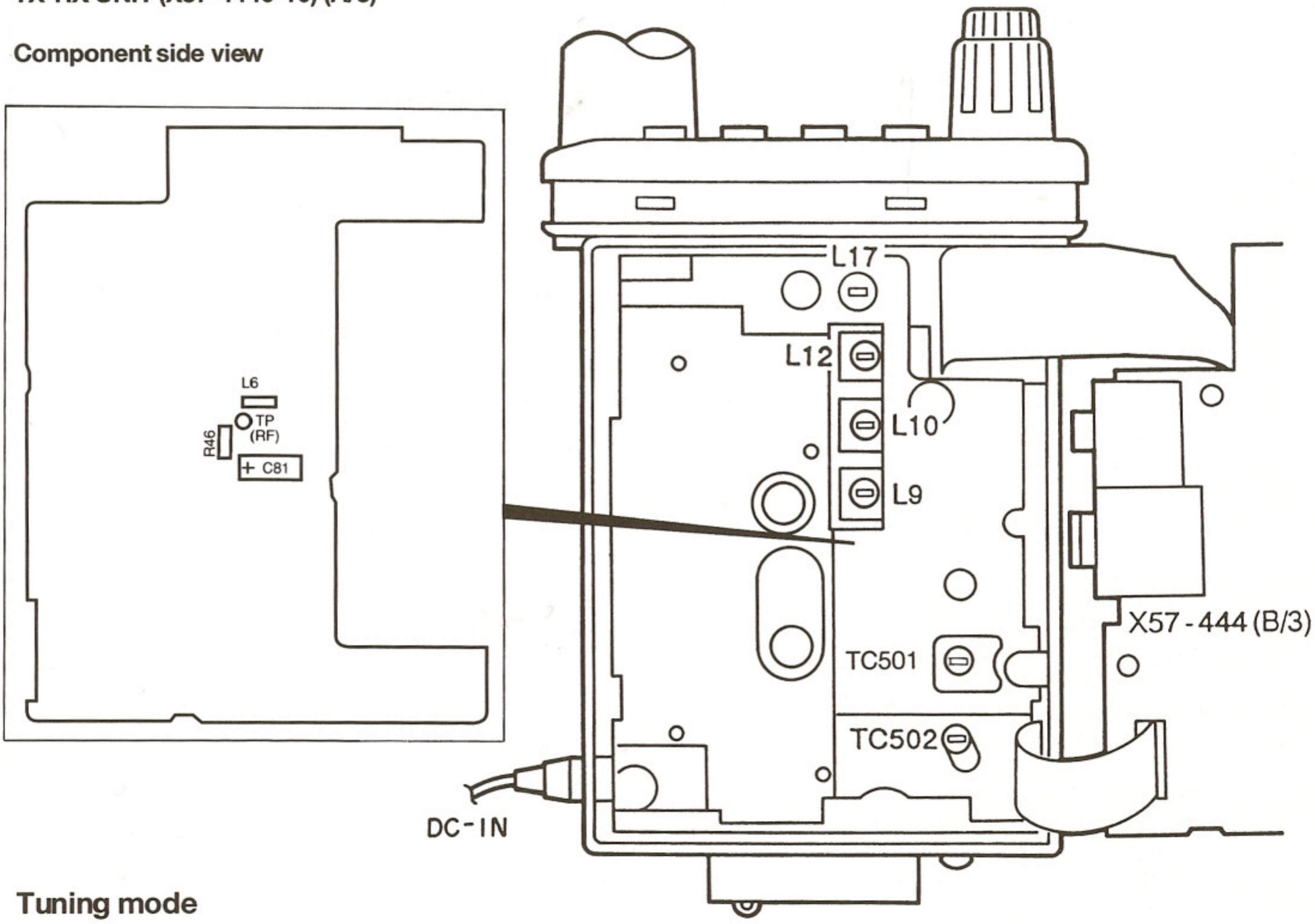


ADJUSTMENT

Adjustment points

TX-RX UNIT (X57-4440-10) (A/3)

Component side view



Tuning mode

Frequency table for using tuning mode

CH \ Destination	K, M ,T, E(TYPE 1)		K2, M2 (TYPE 2)	
	TX frequency	RX frequency	TX frequency	RX frequency
1	162.000MHz	162.100MHz	143.000MHz	143.100MHz
2	150.000MHz	150.100MHz	136.000MHz	
3	173.990MHz	173.970MHz	149.990MHz	149.970MHz
4	162.000MHz		149.000MHz	
5	162.200MHz		149.200MHz	
6	162.400MHz		149.400MHz	

Signaling No. list

Signaling No.	ENC TONE	DEC TONE
1	NONE	NONE
2	QT	QT
3	DQT	DQT
4	NONE	2TONE
5	NONE	DTMF
6	DTMF	NONE
7	DTMF 7	NONE
8	100Hz square wave	NONE

ADJUSTMENT

VCO

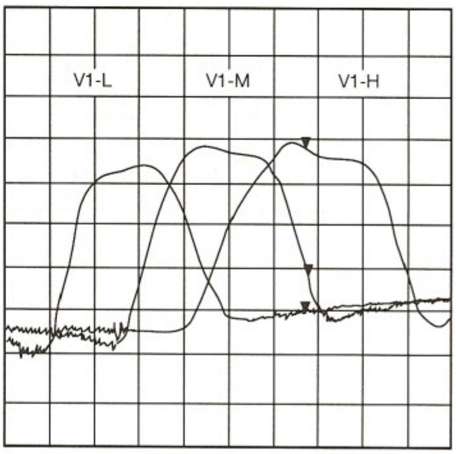
Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. TX lock voltage check	1) CH : Channel with highest freq' fTH	DV.M	VCO	LV	VCO	TC501	3.5V(TYPE 1) 3.0V(TYPE 2)	±0.05V
2. TX lock voltage check	1) CH : Channel with lowest freq' fTL							0.7~1.7V
3. RX lock voltage check	1) CH : Channel with highest freq' fRH					TC502	3.5V(TYPE 1) 3.0V(TYPE 2)	±0.05V
4. RX lock voltage check	1) CH : Channel with lowest freq' fRL							0.6~1.7V

Helical

Item	Condition	Measurement			Adjustment			Specifications/ Remarks
		Test-equipment	Unit	Terminal	Unit	Parts	Method	
1. Helical adjustment check	1) CH : Channel with center freq' fRM Connect the spectrum analyzer to TP4(RF).	Trk. Gen. Spectrum Analyzer	TX-RX (A/3)	ANT TP4 (RF)	TX-RX (A/3)	L9 L10 L12 L17	Adjust wave form to figure at below.	
	2) CH : Channel with highest freq' : fRM						Check	WAVE shift to right
	3) CH : Channel with lowest freq' : fRL							WAVE shift to left

CAUTION :

When using an external power connector, please use with maximum final module protection of 9V.



CENTER	162.00MHz
SPAN	50MHz
MARKER	146MHz
4MKR	20.64MHz
TG LEVEL	–5dBm